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The Outlook

Evacuee—Evacuum

IF there is one thing at which, in this war, we have proved ourselves adept it is evacuation. We got out of Norway; we got out of Belgium, and we got out of France. In fact, we may claim to be the world's champion evacuists. Possibly it is this fact which has led Captain Norman Macmillan to suggest, in his article in this issue, that the whole "redundant" population of the United Kingdom should be transferred to the western hemisphere.

The idea is attractive. What a real he-man's country the United Kingdom would be! The "necessary" population could get on with the job, and presumably could be regimented, disciplined and rationalised in a manner which would end the war in less than half the time it would otherwise take.

Some months ago Captain Macmillan suggested in one of his articles in *Flight* that the entire aircraft industry should be shifted, lock, stock and barrel, to Canada and America. We pointed out that there were certain minor snags in the scheme, such as the time it would take to dismantle the shop equipment, ship it across and re-erect it on the other side, not to mention the amount of shipping which would be required. His latest scheme is scarcely more practicable.

Captain Macmillan does not mention what percentage of the population he regards as "redundant," but presumably it would run into many millions. Nor does he explain how he would find sufficient shipping to transport these millions, and sufficient Naval forces to convoy them. And, of course, there is the little matter of finding accommodation for them on the other side. The big-heartedness of our cousins over there is not in doubt, but even their wide open spaces might feel the strain, not to mention the fact that they would be somewhat "drafty," particularly with winter coming on.

We publish Captain Macmillan's article because it does represent a point of view which is held by a number of people, but we do not share his faith in the feasibility of the scheme, nor do we agree that there is, or is likely to be, any need for such extreme measures.

Figures—Of Speech?

THE disclosure by President Roosevelt, in his recent speech at Boston, that favourable consideration is to be given to the request of the British Purchasing Commission that our order might be increased by 12,000 aircraft, will be generally welcomed. A total number on order of 26,000 American aeroplanes will make a useful addition to those which we shall be making ourselves. But the American aircraft industry, as we have frequently pointed out, cannot perform miracles. It will need time, a good deal of time, to get up to the sort of production figures which politicians love to quote, but which are difficult to translate into actual deliveries. Mr. Wendell Willkie, Mr. Roosevelt's rival for the presidency, is reported to have said, *apropos* Mr. Roosevelt's instructions to the Priorities Board to give the British Purchasing Commission's request sympathetic consideration, that if he were elected president, "such matters would be so common that they wouldn't be news."

In the meantime, the cold, hard fact is that up till now the maximum deliveries of American aircraft to this country in one month have been 500. It is expected that this figure will soon grow to 800 per month, so obviously there is need for Mr. Willkie's promise to make a hundred aeroplanes grow where but one grew before.

We are duly grateful to the United States for the aeroplanes we have been allowed to buy, but no good purpose can be served by swallowing promises made during a presidential campaign, when things are always said

which are regretted afterwards. By way of getting down to earth again, we would recommend readers to study the list on page 390, which shows the orders on hand at the various American aircraft factories for the American Army and Navy.

Italy and Greece

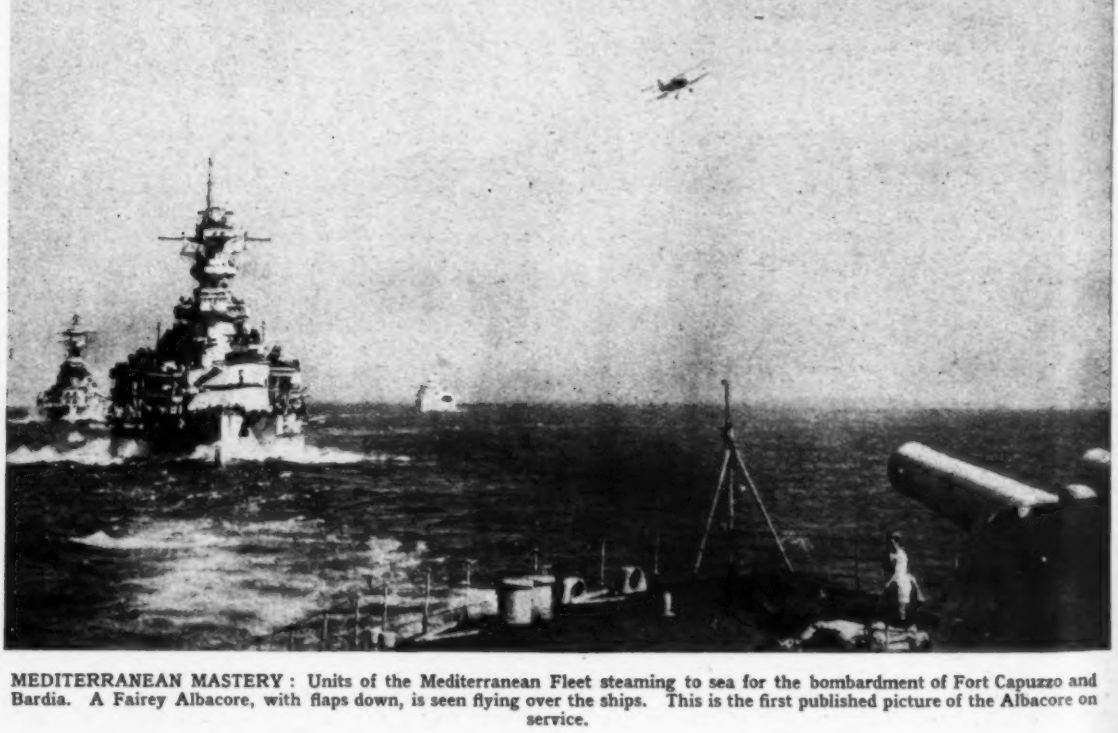
AXIS policy is sometimes puzzling. The air assault on Great Britain with a view to clearing the way to invasion has clearly failed. The Germans seem to have withdrawn most of their heavy bombers from the stations in Northern France—at any rate they have been careful not to lose many of them in raids on Britain. At the same time some Italian bombers are said to have taken some part in a day raid on this country. In Northern Africa the weather is improving as the winter draws near, but Marshal Graziani delays his advance—perhaps because the R.A.F. bombers have obliged him to do so. In the mountains of Greece and Albania the autumn weather brings snow and cold, yet there the Italian Army is commencing an invasion. To add to the puzzle, Germany seems to be still at peace with Greece, though that state of affairs can hardly last for long.

Greece has won the admiration of the world by the spirit with which she has declined to submit to the invader. She is handicapped in the struggle by her poverty. A country in the position of Greece must needs have an Army and also a Navy. Her Navy is small but efficient, and in various past Balkan embroglios it has made itself felt. Now Greece needs an Air Force as well, a need which did not stand out so clearly in times of peace. She could not afford the money to be equally strong in all three elements, and the claims of Navy and Army seemed to her to be irresistible. Despite its small size, and the absence of the latest types of aeroplane in its equipment, the Greek Air Service has shown a fine spirit in taking the initiative with its bombers and also in using its fighters to assail the Italian bombers. Fortunately for the little country, the R.A.F. and the Fleet Air Arm are determined to give her all the air assistance in their power, and they have no exaggerated respect for the *Regia Aeronautica*.

Bombing in Libya

IT is interesting to speculate whether it is really the activity of the R.A.F. in the Middle East which has prevented the Italian Army from advancing into Egypt. It is known that that Army is dependent for supplies on a few harbours, all of which have been subjected to repeated raids, while the Royal Navy has every now and then sent a force to shell them. At the same time, there must have been great stores of material already in Libya, for the Italians there were prepared to fight on two fronts, and now the French front in Tunisia gives them no anxiety. All the stores which had been got ready for the western forces are now available for the force which threatens Egypt, and it is rather hard to credit that Marshal Graziani is in constant need of replenishments from his homeland.

If it is actually the case that it is the R.A.F. which is holding up the Italian advance, that fact must go to the credit of the bomber aeroplane. Previously the bomber, acting on its own, can claim to have prevented the British forces from establishing themselves in Norway, but all its other successes have been made in the course of clever co-operation with other arms. Perhaps the Libya case can now be added to the Norway case. In both these cases, however, the circumstances have been very unusual, and in the case of Libya the crux of the matter has been the small number of ports through which the Italian Army could be supplied.



MEDITERRANEAN MASTERY: Units of the Mediterranean Fleet steaming to sea for the bombardment of Fort Capuzzo and Bardia. A Fairey Albacore, with flaps down, is seen flying over the ships. This is the first published picture of the Albacore on service.

WAR in the AIR

Italy Invades Greece : R.A.F. and Navy to the Rescue : Berlin Bombed in a Snowstorm

THE expected development in the Balkans has come, not in the form of an advance by Marshal Graziani in Libya, but as an invasion of Greece by Italy through Albania. The old rivalry of Rome and Greece has become active once more. In ancient days the two were rivals in arts, in which the Italians never succeeded in equalling the Greeks, and in war and methods of government, in which Rome proved supreme. The extension of Roman rule over the province of Achæa, as the Romans termed the country, did not make for the prosperity of the conquered land, and if it should happen that Italian armies should once more overrun it, there is still less likelihood of Greece being anything but a sufferer. Thrice at least the fate of the Roman Empire was decided by battles fought on Greek soil. Julius Caesar defeated Pompeius at Pharsalus; Antonius and Augustus avenged the murder of Cæsar by defeating Brutus and Casius at Philippi, and Augustus routed Antonius and Cleopatra in a sea fight off Actium. May it not be that the ambitions of the latest Dictator of Italy will be brought to an end by a fight on or off Grecian land?

More recent history tells how Greece regained her freedom from Turkish rule by the British naval victory of Navarino. Since then the friendship of Britain for Greece has been proverbial, but the whirligig of time has decreed that no longer is Turkey the enemy of Greece and Britain. That enlightened Republic has made treaties with both, and in certain circumstances she will undoubtedly fulfil her undertakings and take up arms on the side of her former antagonists.

Spirited Greek Pilots

AUTUMN is surely a strange time of year for the Italians to undertake the invasion of a mountainous country. So far as land operations go, the Greek Eftzoes should be able to put up a strong defence against the Alpini in the snow-covered mountain passes, and in such terrain tanks are at a discount. Aeroplanes can fly over the mountains, and in that arm Italy is very much stronger than Greece. That the latter country is not without consciousness of the importance of the air was proved by the connection which its Government had with the Blackburn firm for several years, but its air arm is not strong in numbers. It certainly has some Gladiators and some Blenheims, and the R.A.F. in the Middle East has shown that Gladiators in the hands of first-class pilots can master Italian fighters and bombers, so long as the latter will stay to fight it out. But it is doubtful if the Greeks have more than 150 first-line machines all told. That their pilots are not lacking in the offensive spirit was proved when on the third day of hostilities three Greek bombers, probably Blenheims, bombed and machine-gunned Italian reinforcements who were moving up on the northern front. They all got back, but one machine was badly shot about by rifle fire and one of the crew was wounded. The Greeks have admitted that one of their fighters which attacked Italian fighters over Albania has not returned. The Italians have admitted the loss of a bomber.

Of course the Italian bombers were early in evidence,

DESERT FIGHTERS : Hawker Hurricanes are operating in the Western Desert and giving the Regia Aeronautica a taste of what the Luftwaffe has had over Kent.

and some of them promptly appeared over Athens, but do not seem to have dropped any bombs. One of the good points in Mussolini's character is his respect for archæology, and we may believe that he would not approve of his airmen doing any harm to the priceless buildings on the Acropolis. None the less, the whole world of art and archæology will be glad that the Elgin marbles, once the frieze of the Parthenon, are safe in the custody of the British Museum, and have not been replaced in their original position—which some people used to think ought to be done. The town of Patras, near the entrance to the Gulf of Corinth, was, however, heavily bombed by the Italians, and there 110 people were killed and 300 odd wounded. Italian bombers also attacked Tatoi, the airport outside Athens, and the bridge over the Corinth canal. Greek fighters attacked the raiders, and A.A. guns opened fire. It is reported that the bombs missed the bridge. The destruction of that bridge would be a serious handicap to communications in Greece, as it would cut off the Morea (more familiar to historians as the Peloponnesus) from the mainland.

Greece, in fact, will have to depend chiefly on the R.A.F. in the Middle East and the Fleet Air Arm in the Mediterranean for help in the air. All the assistance in our power has been promised to her by the British Prime Minister, and at first that help is likely to be chiefly in the air and on the sea. The form which it will take will be discovered by the Italians in due course, and British plans are naturally not being published in advance. On October 30 the R.A.F. reconnoitred Greek and Italian coastal waters, and shot down a Caut Z506.

The whole situation in the Balkans is very obscure, but very interesting. Bulgaria is a small Power which still grieves for the territory she lost as a result of having joined Germany in the last war, and she is certainly Axis-minded. Should she join in the attack on Greece, that would automatically bring into operation the treaty between Greece and Turkey. The position of Yugoslavia

ROCK DEFENCE: A 40 mm. Bofors A.A. gun mounted at Gibraltar.

is not clear, and Soviet Russia remains the great unknown factor. The Turkish Army is always a tough fighting body, and it is understood to have been modernised of late in many respects. Its air arm is small, but is certainly of very good quality, and the training system is sound. The equipment includes Blenheims, and probably both Gladiators and Hurricanes. But, if she joins in the war, Turkey, too, will have to depend chiefly on the R.A.F. and the F.A.A. for air assistance.

In a number of respects the spread of the war to Greece is not unfavourable to the British position in the Middle East. The Greek islands and harbours become available for use by the Royal Navy and the R.A.F., and they will make splendid bases. From them the R.A.F. will be able to strike out in many directions, even, if need be, to the oilfields of Rumania. Rhodes and the other islands of the Dodecanese will seem farther away from Italy than ever. Some of those islands have to be supplied with water brought in ships from Italy, and the task of escorting them will now be more dangerous than before. The Royal Navy lost no time in bombarding one of these islands, Scarpanto, and reports say that a wireless station and a military barracks were destroyed. It is further added that 500 Italian soldiers were killed in the barracks. Later an Admiralty *communiqué* dated October 29 stated: "Naval aircraft of H.M. ships of the Mediterranean Fleet have carried out an attack on Maltezana, capital of the island of Stampalia in the Dodecanese, which is the nearest Italian air base to Athens. A hangar was hit and set on fire and the seaplane slipway was damaged by a direct hit. A considerable number of bombs were dropped on barracks and on the ammunition dump area, causing heavy explosions, which continued for some time after the aircraft had left the area. Incendiary bombs were also scattered over the target area. All our aircraft returned safely." The waterways off the Grecian coast which might be of use to Italian warships have been mined by the Royal Navy. If the British task in the Mediterranean has been made greater, so has that of the Italians. Though the Straits of Otranto between Italy and Albania are narrow, still water is water, and now the Italian Navy, which does not dominate the Mediterranean, has to maintain communications between the mainland and two Armies across the water. That suggests many possibilities, which no doubt the Royal Navy has considered.

The advance of Marshal Graziani's Army in Libya still hangs fire, at the moment of writing, and the R.A.F., the F.A.A., the South African and the Rhodesian Air Forces continue to harry its ports and concentrations, as well as bombing objectives in Abyssinia and East Africa. Whether Graziani will advance so as to divide British energies between the defence of Egypt and the helping of Greece remains to be seen.

The Italians, too, are said to have been dividing their forces, though the *Regia Aeronautica* is none too large for all the work which it is supposed to do. The Germans have announced that Italian bombers have lately been taking part in the raids on Great Britain. According to the *Giornale d'Italia*, Mussolini has taken a personal decision to create a special Italian air corps to take part in the bombing of London. This force, adds the newspaper, will be of impressive size. It will be made up of both fighters and bombers under the command of General Rino Corso Pougier. The Stefani Agency says that this marks the beginning of action against the metropolitan territories of Great Britain "as a reprisal and severe warning against the aggression of the R.A.F. over the territories of Northern Italy."

WAR IN THE AIR (CONTINUED)

Fidgeting Over Britain

SOME time ago it was stated in these columns that the Battle of Britain was over and won, and that what raiding continued was of the face-saving order. German heavy bombers seldom now make their appearance, and it is left to the fighters and fighter-bombers to carry on the work. As a result, the numbers of enemy aircraft destroyed have shrunk, though occasionally the British fighters are successful in making what may be described as a respectable bag. On *Tuesday, October* 29, for instance, they shot down 30. Eight of these were due to a very fine fight by one of the Scottish Auxiliary squadrons. The attention of the Scots was first attracted by puffs of A.A. shells in the sky near the South Coast; one of the most useful functions of A.A. guns is to attract the attention of fighter patrols by day. The target proved to be 50 Me 109s, and the Spitfires shot four of them down before the Germans seemed to realise what was happening. The rest then woke up to the realities of the situation, and set course for home, that is for France. But the Spitfires had tasted blood, and they followed out to sea. The Me 109 needs a long start if it is to escape from a Spitfire, and in this case the start was not long enough. So the Scots put four more of them down into the sea.

A formation of 50 has not been common during recent days. The tactics of the raiders were aptly described in one Air Ministry communiqué as "fidgeting about" over the South of England. The same writer remarks: "Some of the Messerschmitts have been almost playful in their behaviour. A Hurricane squadron found twenty of them milling about 20,000 feet above Surrey. As soon as the Messerschmitts sighted the Hurricanes they formed into two sections and made dummy dive attacks on each other. Then two of the Messerschmitts broke off and dived steeply down in front of the Hurricanes as a further decoy."

Another unusual story concerns a Spitfire pilot who took up formation at the rear of a lot of Messerschmitts, mistaking them for his own lot. "When I realised what I was doing," he said, "I got a pretty fair shock. I went in to attack double quick, and a running fight began. One Messerchmitt did a barrel roll to the left. I fired at him as he did so, and he dropped back. I was then engaged from astern, and lost a bit of ground. By the time we got to Hastings I had caught the rest of them up again, and knocked bits off one. Another was half a mile or more below, and behind the others as they crossed the coast. He was dropping back rapidly, and I was hoping to finish him off when six more Messerschmitt 109s came down at me from over the Channel, in line-abreast. They

went into line-astern, and circled round me at about thirty yards intervals, but number six was about a hundred yards behind number five, so I went for him. He climbed steeply in a close turn. I had about 300 m.p.h. on the clock, so I pulled up almost vertically and gave him a burst flat into his feet from beneath. He rolled over and went straight down. By this time number one was on my tail, so I went down behind number six, who was still going straight down in slow aileron turn at 10,000 feet. But number one was still worrying me, so I went into a steep left-hand turn and blacked out. On recovering from my black-out there were no more enemy planes in sight, so I climbed up again and went home."

Less Destruction

OF course these fidgeting raids do some damage, but the few bombs carried by a fighter-bomber naturally do not have so much destructive effect as the load of a Dornier 215 can have. Houses and other buildings are destroyed and people are killed, but the present scale of damage does not compare with that of the earlier days of the raids on London. By night, too, the difference is marked, but of late the night raiders have paid more attention to Midland towns and to Liverpool than to London, and the damage in the former has been greater. In London the raids start either just before or after 7 p.m., and usually there has been a good deal of gunfire at first. This may have had a deterrent effect, for long periods of quiet have ensued on most nights, and sometimes the activity has been almost negligible after midnight. Londoners in most districts have enjoyed sound sleep, and feel all the better for it.

On one night, *Tuesday, October* 29, the raiders met with a surprise, for along their usual lanes of entry from the South East they were met by a concentration of guns which extended for some miles inland. The German pilots did not relish it, and quite a number of them promptly unloaded their bombs in open country and turned back to France. The number of night raiders destroyed has also been slowly increasing. It has not yet reached such proportions as to have any striking effect on the *moral* of German air crews in general, but it is already sufficient to make them realise that night raiding over Great Britain is not quite such a safe amusement as it once seemed to be. The foggy weather also has its effect. No doubt some of the landing grounds in France are fogged, and so only the most experienced German pilots are allowed to start off. Not long ago three or four German bombers were found crashed in different parts of the country, with no marks of shot or shell on their machines, and the conclusion must be that inexpert pilots lost control in fog and perhaps got into a spin and crashed.

"Empress of Britain" Bombed

AIR bombs have not proved very effective against moving warships, but merchantmen are easier victims. On October 26 a German bomber attacked the Canadian Pacific liner *Empress of Britain* when she was approaching the Irish coast and was about 150 miles away. First the bomber attacked the defence gunners on the decks with its machine guns. The men fought back with courage and resolution, but were mostly killed or wounded. Then a high-explosive bomb was dropped, followed by fire bombs, and the vessel was set on fire. The passengers and crew took to the boats, and later on they were picked up by warships. Out of a total of 643 on board, some 598 survivors were landed in Great Britain. The liner was taken in tow, but blew up and sank. Among the survivors were military families and a small number of military personnel. This fact has been frankly admitted. Perhaps the Germans may claim that the presence of soldiers on board justified the sinking—though it does not matter much to the Germans whether they have an excuse or not.

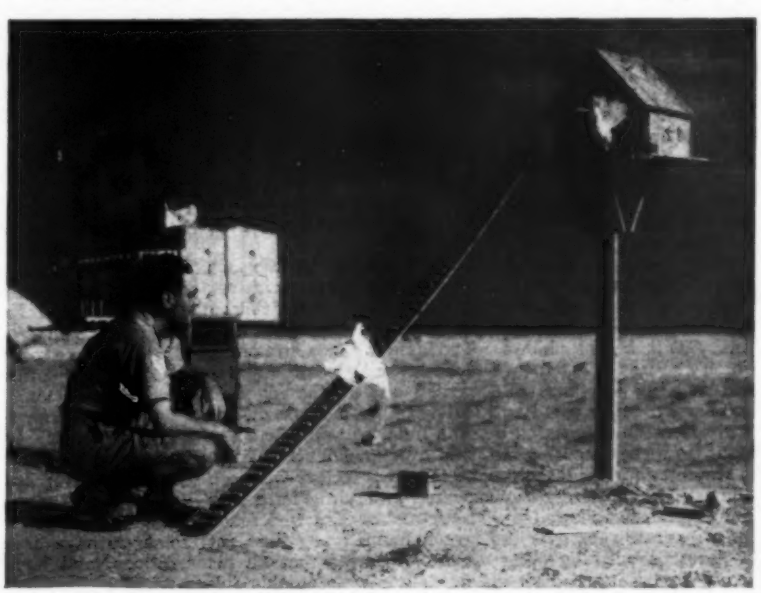
The United States Government have commandeered 60 fighters and 50 light bombers built by the Republic Aircraft Corporation for Sweden, on the ground that they are urgently needed by the Army Air Corps for advanced training.

There are some 100 American-built aircraft at Martinique, which were taken there in the French aircraft carrier *Béarn*. It has been stated that they were unloaded from the carrier and left in the open until they became so rusted that they are no longer fit for use.

The Ministry of Information has published the following: Reports are being received of small objects about the size of a Mills bomb or a 50-cigarette tin, possibly with wire attached, being dropped by enemy aircraft. The public are warned not to handle such objects, which may be dangerous. They should be reported to the police or wardens.

A Balloon Story

THE Balloon Barrage men do not often get into the news, but they amply deserve a little public attention. Here is one story: A balloon crew was working on the balloon bed before reinflating when a raid began. The time was 1.27 p.m. Eight bombs fell near the site and a crater was made 20 yards from the bed. One bomb only ten yards away did not explode, and the site was temporarily unserviceable. Work was begun immediately on a new site 250 yards away. Then another raid started. The time was 6.24 p.m. A large number of bombs were dropped, eight of which were unexploded and near the new site. The work had to be abandoned and a third site was chosen. Work on the new bed began at dawn. More equipment had been collected and the balloon was flying at 3.30 p.m. Next day at 4.20 p.m. the balloon was shot down. A 500lb. bomb



DESERT DIVERSIONS: An R.A.F. sergeant teaching a young dove to taxi up to its hangar.

WAR IN THE AIR (CONTINUED)

AIR LOSSES DURING WEEK ENDING NOVEMBER 2

		GERMAN Aircraft	BRITISH Fighter Aircraft	Pilots
Oct.	27 ...	13	8	4
	28 ...	6	—	—
	29 ...	33	7	2
	30 ...	10	5	4
	31 ...	—	—	—
Nov	1 ...	16	7	5
	2 ...	9	—	—
		87	27	15

British Bomber losses over enemy territory :—Oct. 27, 1; Oct. 28, 1; Oct. 29, 2; Oct. 30, 1; Oct. 31, 1; Nov. 1, 2. Total, 8

fell within 50 yards of the bed and three more in a field close by. The gas trailer was thrown into the air and all the bottles scattered. The bed itself was not badly damaged. No bottles exploded, and there were no casualties to personnel. As soon as the raid was over, the crew salvaged as much as possible of the cable, another balloon was delivered, and the crew collected the scattered bottles, inflated their balloon, and had it flying by 8.30 p.m. Between the afternoon of the first day and the evening of the third the crew were bombed out of two sites and the balloon on their site was shot down and replaced. When the Squadron Commander proposed relieving the crew, they asked to be allowed to stay.

The British Counter-attack

THE Beaufort torpedo-bombers have again come into the limelight. The R.A.F. pilots who had been trained in the very skilled work of making a torpedo attack must have been chafing all through the early months of the war when they were unable to exercise their art. Doubtless they envied their opposite numbers in the Fleet Air Arm, who had been using their torpedo-carrying Swordfish to good effect The coming of the Beauforts has now given the torpedo men of the R.A.F. their chance, and they are seizing it with eagerness. On the morning of October 26 they sank a 2,500-ton enemy supply ship near Sogne Fjord, Norway. Three Beauforts were on offensive reconnaissance patrol off the Norway coast when they sighted the ship, and dived to make a torpedo attack. The ship was struck, blew up and disappeared within thirty seconds. Immediately afterwards, the Beauforts were engaged by a strong force of Messerschmitt 109 fighters. A hard-fought action against heavy odds ensued. One of the British pilots quickly shot down the first Messerschmitt which came up against him. Then he went to the assistance of a Beaufort which was fighting two of the enemy, and drew the fire of the Messerschmitts away from his comrade. While he was effectively carrying on this two-to-one combat, a third enemy aircraft attacked him from the other side and he lost touch with his comrade. Fortunately, he was able to gain cloud cover. From this action two of our aircraft did not return to their base.

Though the German air attack on Great Britain has grown less intense of late, partly perhaps because of weather conditions, the R.A.F. Bomber Command is not deterred by such considerations, and has been multiplying and intensifying its hammer blows. The famous Skoda armament works at Plzen (Pilsen), in Czechoslovakia, was the objective of a long-distance raid carried out on the night of October 27. Low cloud and bad visibility met the raiders as they neared Plzen after a seven hundred and fifty miles flight from the English coast, and over an hour was spent in searching for the target before the great factory was seen silhouetted against the snow-covered ground. Fierce fires and explosions followed the attack and a pilot who made three separate runs over the target, bombing by the light of flares dropped by other aircraft, reported that all his heavy bombs found their mark. These were quickly followed by incendiary bombs, which set fire to the damaged buildings.

Berlin, too, receives its regular unwelcome visitors, and so do very numerous other important targets. A very notable raid on Berlin was made on October 29, and an account of it may be taken as typical of many other operations during the past days. The first contingent of the British bombers arrived over the German capital soon after 9 p.m. Snowstorms, which had hampered the raiders for the last 100 miles of their journey, were raging also over Berlin, and the bad visibility, combined with the intense barrage of light and heavy A.A. fire from the ground defences, made the task of target location difficult in the extreme. After dropping a number of parachute flares, the first raiders succeeded in finding their target, but the driving snow obscured observation of the results. The difficult conditions under which the raid was carried out have been graphically described by the pilot of the first aircraft to reach Berlin. "The early part of the journey," he said, "was grand. Visibility was excellent and we could see the stars in an almost cloudless sky. Then, quite suddenly, we ran into a snowstorm, which kept us company all the way to Berlin and most of the way back. Some of the snow, which was fine and powdery, blew into my cockpit and lay two inches thick on the dashboard recess. To make matters worse, the windscreens of the two front cockpits were completely covered, so that we flew many miles almost blind, depending entirely upon our instruments. We had hoped to get clear of the snow before reaching Berlin, but, if anything, it was worse when we arrived. Still, we managed to find our target, a large electrical works, and bombed it through the snow."

One of the British raiders in the attack on Berlin that night became iced-up as it approached the German capital and fell into a flat spin from a great height. The pilot let go his bombs to lighten the aircraft, but, as the spin persisted, the crew were warned to get ready to abandon the aircraft. It was not until the bomber's trailing aerial had been wrenched off by contact with the ground that the pilot finally succeeded in getting his machine under control. Describing the adventure on his return to England, the bomber pilot said that his crew were not at all keen on the idea of abandoning their aircraft over Germany. "My navigator," he said, "who is a young Australian from New South Wales, told me that he didn't want to have to eat ersatz sausage for breakfast for the rest of the war. He seemed quite confident that we should pull out before we hit, and pointed out afterwards how sick we should have been if we had jumped and then seen the aircraft recover from the spin and fly off without us."

On the night of Thursday, October 31, a small force of aircraft of the Bomber Command raided oil tanks and railway stations at Naples.

A Profit and Loss Account

DURING the past twelve weeks of attack on Great Britain the *Luftwaffe* has lost three aeroplanes and fourteen airmen for every one of the R.A.F. Counting from August 8, the enemy has lost 2,433 machines, about equally divided between fighters and bombers. Allowing an average of 2½ airmen for each German machine, that means that some 6,070 airmen have been either killed or taken prisoner. In the same period the Fighter Command has lost 353 pilots. In one week in August the German losses amounted to 472 machines. The last great assault made by the enemy was on September 27, when they sent escorts in the proportion of four fighters to each bomber. That day they lost 133 machines. Since then heavy bombers have only rarely appeared over Great Britain. Fighter-bombers have taken their place. The change resulted in a substantial drop in the daily rate of German losses, but of late the R.A.F. fighters have been adapting their tactics to the new conditions, and have taken a small but steady toll of the raiders.

THE ARMY and the AIR

Unity of Responsibility

By MAJOR F. A. de V. ROBERTSON, V.D.

IN a recent issue *Flight* commented briefly in its editorial columns on the question of a separate air arm for the Army. The subject involves deep principles, and deserves more detailed analysis. The debate in the House of Lords on October 16 only skimmed the bare surface of the matter, and the advocates of reform did not make their voices heard. Perhaps none of them was present in the House.

The present position is that the Royal Air Force supplies all the aerial requirements of the Army. In defence of that position it has been urged (a) that separate arms for the Navy and the Army had to be abolished in 1918 because the prevailing system did not work well; (b) that the R.A.F. ought not to be split up; (c) that on occasions the whole of the R.A.F. must assist the efforts of the Army; and (d) that there are no complaints of the Army being dissatisfied with the aerial help supplied in the present war.

These pleas need examination. It is admitted generally that the old system which ended on April 1, 1918, was not satisfactory. The chief reason why it did not give the best results was that, while the Army had its Flying Corps and the Navy had its Air Service, there was in existence no Royal Air Force. The ideal way of reforming in 1918 would have been to institute an Air Force while leaving the two older Services with their ancillary air arms, though the latter would have had their size adjusted to conform with circumstances. The R.F.C. and the R.N.A.S. were both too rigid, and there was no flexible body, no pool so to speak, to compensate for their rigidity. Often the Army borrowed fighter squadrons from the Navy, which was quite a wrong way of doing things. Naval discipline, naval pay, and various other things are quite different from those of the Army. Also, as will be set forth with more emphasis later on, the practice of borrowing by one Service from another is inherently bad, and should only be resorted to in emergencies and for very limited periods.

The Need for Flexibility

Now, however, we have an Air Force, and its existence removes the chief objections to allowing the other Services to maintain air arms of their own. In this connection, when mentioning the Air Force, it is chiefly the Bomber Command which is in mind. This Command must always be flexible, always prepared to undertake a campaign on its own, to help the Navy, or to help the Army, as the Higher Command of the country shall from time to time dictate. In the present war it has already performed all these three functions. On the occasion of the evacuation from Dunkerque the Fighter Command also (and, of course, the Navy, too) came in full force to the help of the distressed B.E.F.

The second plea put forward for the perpetuation of the present system is that the R.A.F. ought not to be broken up. That is chiefly a sentimental plea. It was advanced in the case of the Fleet Air Arm, and after many years of discussion was overruled. Men like Lord Trenchard, who have been concerned with the growing up of the R.A.F. from infancy through adolescence to manhood, hate the idea that any body except the Air Ministry should have power over any warlike aeroplanes. In a very similar way Brigadier Spears, M.P., objected to the R.A.F. possessing its own armoured cars. Things which move and fight on the ground, he urged, ought to belong to the Army. The Government did not accept his argument as valid. Why, then, should the theory that everything which flies must belong to the Air Ministry be considered sacrosanct?

The third ground of objection to reform, namely, that on occasions the whole R.A.F. must come to the help of the Army, is no ground at all. Most obviously the R.A.F. must in time of need do that, whether or not the Army has an Air Arm of its own.

The last argument, that the present system has worked without any complaint, will not hold water. It may have worked quite satisfactorily so far in the present war; but the fact that a certain organisation has worked without a hitch at a certain time is no reason for arguing that the system itself is sound. Systems, like the parts of an engine, need the scrutiny of some A.I.D. to make sure that there are no cracks in them which may cause a breakdown in times of unusual stress. The Admiralty could point to at least one occasion when the Air Ministry control of the Fleet Air Arm caused a breakdown. That occasion was when the trained observers with the Mediterranean Fleet were transferred by the Air Ministry just as the Fleet was about to undertake its annual gunnery practice. The Air Ministry, so to speak, promised with tears in its eyes that such a thing should never happen again, but the Admiralty demanded that it must have complete control over the observers, and that point was promptly conceded to it. So was one possible cause of future trouble removed.

The Chance of Friction

With that lesson in its mind, the Air Ministry has since been specially careful to give the War Office no grounds for complaint. But the possibility of friction always remains, and it ought to be removed. A system wrongly founded is like the engine part with a crack in it. The engine may work for a considerable time, but there is always the risk of a catastrophe. The cracked part ought to be eliminated. In other words, the Army ought to have an Air Arm of its own, for which the War Office alone should be responsible.

The exact limits of what the arm ought to be are not so easy to lay down. There are border-line cases. But, at the very least, the special squadrons known as Army Co-operation Squadrons ought to be handed over to the War Office. They are of no real use to anybody but the Army. With their specially designed aeroplanes and their specially trained observer-pilots they could add nothing of any value to the work of the Bomber Command, the Fighter Command, or the Coastal Command. Up to fifty per cent. of the observer-pilots are, or may be, Army officers seconded to the Air Force. Nobody has given any reason, or could give any reason, why the whole personnel should not be drawn from the Army and be subject in every respect (e.g., discipline, pay, promotion) to Army regulations. Many of the R.A.F. pilots in those squadrons are so keen on that particular branch of air work that they never want to leave it for any other. They become Army specialists, and the longer they stay at that work the more valuable they grow to the Army. To transfer such a man to fighters or flying boats is a tragedy to him and a loss to the Army. It is best to leave him at his Army work; and, if so, then there is no valid reason why he should not be a khaki-clad soldier instead of a blue-clad airman. Why the Air Ministry should raise objections to the handing over of these squadrons to the War Office is one of the psychological puzzles of departmentalism.

Strategic Reconnaissance

The Army also needs aircraft of longer range whose crews are carefully trained in strategic reconnaissance. Before the war broke out the Air Force had put some bomber squadrons through a course of training in such work. The danger of depending on such an arrangement is that the Air Ministry may one day recall those squadrons and turn them on to the ordinary work of the Bomber Command. The carefully trained crews, who would be indispensable for Army operations, might all be shot down in raids on the invasion ports, or might be transferred, man by man, to other bomber squadrons. That risk can only be eliminated by making such squadrons part and parcel of the Army.

UNITY OF RESPONSIBILITY (CONTINUED)

But, above everything else, the whole system of one Service providing some body and handing it over to the operational control of another Service is essentially vicious. It worked badly in the case of the Fleet Air Arm; it has worked badly in the case of the A.A. guns and searchlights, and it may at any moment work badly in the case of the air squadrons needed by the Army. It is human nature that the department which has to raise and equip the body over which some other authority will take command cannot feel the same enthusiasm to turn out the best possible which it would feel if it were providing a body for its own employment. The most grievous case was that of the A.A. guns and searchlights at the time of the Munich crisis, and the position then has been set forth in detail by Capt. Liddell Hart in his book, *The Defence of Britain*. So long as this system of operational control by one Service over a force supplied by another is the fashion, so long will there be risks of things going very wrong at a critical moment. The fact that in a certain case nothing has so far gone wrong is no argument for defending a practice which is wrong in principle. If we desire safety in the future it behoves us to build on sound foundations.

AMERICA REARMS in the AIR

LARGE contracts have recently been let to the aircraft industry in the United States, giving concrete evidence of the hardening of American feeling against the dictator aggression in Europe. By courtesy of our American contemporary, *Aviation*, we reprint from that journal a list of the contracts awarded on behalf of the Army and Navy since June 1. The list may not be quite complete. As *Aviation* says, "It may be a few squadrons of planes or millions of dollars wrong. There wasn't a summary of orders existing in Washington the day we did this one."

WAR DEPARTMENT

No.	Type	Contractor	Amount
550	Pursuit planes	Bell Aircraft Corp.	$19,896,668
1000	Pursuit planes	Republic Aviation Corp.	56,499,924
600	Airplane engines	Packard Motor Car Co.	62,448,000
540	Pursuit P40	Curtiss Wright	19,688,287
150	Training	Curtiss Wright	4,221,069
46	Transport cargo	Curtiss Wright	12,410,116
	Engines	Lycoming	5,120,997
	Bomber, heavy, 4-engine:		
56	B-24D	Consolidated Aircraft Corp.	14,861,342
277	B-17E	Boeing Aircraft Co.	70,449,955
20	Bomber, light attack: A-20A	Douglas Aircraft Co. Inc.	—
410	Pursuit, 2-engine: P-38E	Lockheed Aircraft	30,278,787
	Trainer, Primary:		
75	PT-13B	Stearman Aircraft Div., Boeing Aircraft Co.	2,041,947
225	PT-17	Stearman Aircraft Div., Boeing Aircraft Co.	
100	PT-19A	Fairchild Aircraft Div., Fairchild Engine & Aeronautical Co.	1,038,300
200	PT-20A	Ryan Aeronautical Co.	2,074,234
500	Trainer, basic: BT-13A	Vultee Aircraft, Inc.	7,438,782
	Trainer, Advanced:		
637	AT-6A	North American Aviation, Inc.	11,335,631
150	AT-7A	Beech Aircraft Corp.	4,847,217
20	Transports, C-45A		
67	AT-7	Beech Aircraft Corp.	3,416,746
33	AT-8	Cessna Aircraft Co.	900,378
6	Observation, short-range liaison: 105	Stinson Aircraft Co.	—
1	Rotating wing, autogiro: XR-1	Platt-LePage Aircraft Corp.	—
120	Pursuit Airacobra	Bell Aircraft Corp., with parts	4,062,270
	Engines	Continental Motors Corp.	1,090,894
	Engines, Model R-1820-65	Wright Aeronautical Corp.	1,488,272
	Engines	Continental Motors Co.	1,370,311
	Bombers and spare parts	Glenn L. Martin	14,269,646
	Training planes parts	Boeing Aircraft Co.	6,934,096
	Bombers parts	Boeing Aircraft Co.	59,762,850
	Pursuit planes parts	Lockheed Aircraft	15,646,450
	Transport planes parts	Douglas Airplane Co.	20,229,184
	Training planes parts	Beech Aircraft Corp.	13,115,138
	Airplane engines	Wright Aeronautical	6,829,144
3000	Rolls-Royce engines	Packard Motor Co.	62,488,000
	(6,000 Rolls-Royce for British Packard Motor Co., $125,000,000)		

NAVY DEPARTMENT

No.	Type	Contractor	Amount
5	Utility-transport	Beech Aircraft Corp.	$258,221
500	Primary trainers	Naval Aircraft Factory	No contract
25	Advanced trainers	North American Aviation	458,104
600	Primary trainers	Stearman Aircraft Div., Boeing Airplane Company	3,779,029
201	Primary trainers	Spartan Aircraft Company	1,859,889
243	Fighting	Grumman Aircraft Eng. Corp.	7,260,230
10	Utility-transport	Grumman Aircraft Eng. Corp.	—
1	Patrol-bomber (experiment)	Boeing Airplane Company	—
1	Transport	Lockheed Aircraft Corp.	117,668
*500	Engines, R-670-4	Continental Motors	1,442,275
*433	Engines, R-680-8	Lycoming	1,527,084
*150	Engines, R-760-8	Wright	562,951

* Engines ordered since July 1, 1940.

Research Council

THE Secretary of the Department of Scientific and Industrial Research announces that under the Order in Council dated February 6, 1928, the Lord President of the Council has appointed Professor A. V. Hill, O.B.E., Sc.D., LL.D., M.D., D.Sc., Sec.R.S., M.P., Sir Felix Pole and Professor Sir Robert Robinson, D.Sc., LL.D., F.I.C., F.R.S., to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. Dr. W. H. Mills, F.R.S., Professor A. Robertson, D.Sc., M.I.Mech.E., M.Inst.C.E., F.R.S., Professor Sir Albert Seward, Sc.D., D.Sc., LL.D., F.R.S., and Sir Harry Shackleton have retired from the Council on completion of their terms of office.

Soviet Civil Aviation

CIVIL aviation in the Soviet Union was instituted seventeen years ago. To-day the U.S.S.R. claims to occupy first world place in respect of air communications. The aggregate length of the Soviet air lines is now 88,235 miles, having been increased by 4,350 miles during the past year. Across the whole of this stretch civil transport aviation is busily carrying on its work.

Soviet aeroplanes maintain regular services to the Far North and to the Far East; they fly across the Pamirs, through the republics of Central Asia and over the mountain ranges of the Caucasus. This year passenger traffic was opened on the air lines Moscow-Irkutsk, 2,820 miles long, and Moscow-Alma-Ata, 2,222 miles long. Aeroplanes regularly leave Moscow for Leningrad, Kiev, Ashkhabad, Tbilisi, Mineralniye Vody and other centres.

Air communications have now been established between Kiev-Lutsk-Rovno-Minsk-Pinsk; Belostok-Lida; Leningrad-Petrozavodsk. Soviet planes maintain services in the new regions of the Karelo-Finnish Soviet Republic. Regular air communications are maintained with Bessarabia and North Bukovina and with the Baltic republics of the Soviet Union.

The international air services maintained by the Soviet Civil Aviation Fleet include Moscow-Berlin; Moscow-Sofia; Moscow-Stockholm; Alma-Ata-Hami (China).

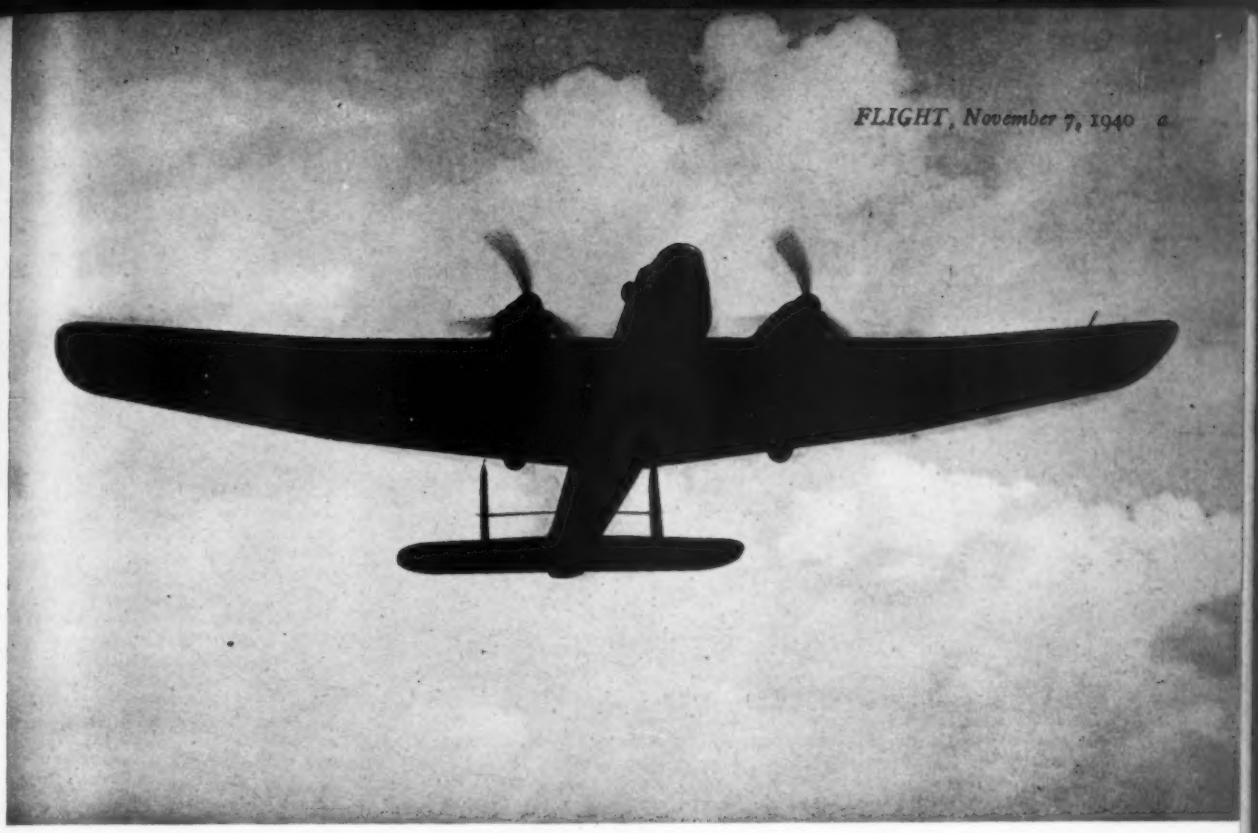
In 1939 the Soviet air services transported more than 307,000 passengers, 11,517 tons of mail and 39,654 tons of freight. In July, 1940, alone, over 40,000 passengers were transported by Soviet civil aircraft.

New Air Mail Pick-up

THE pick-up device used by All American Aviation on its air mail routes will be improved by the use of a retractable arm instead of the 55ft. cable previously employed. The arm, which is 15ft. long, is hinged down from the rear end of the fuselage and has a cable connecting its lower end to the forward part of the aeroplane. The pick-up hook is on the lower end of the arm. The delivery container is also carried on the end of the arm and is released electrically.

The new device will allow the height of the ground station (which consists of a line running horizontally between two poles) to be reduced from 40ft. to 20ft. The speed of pick-up will also be increased from 90 to 110 m.p.h., and the weight of package from 20 to 50 lb. After making the pick-up the load will be raised electrically instead of manually to the aeroplane.

For fragile deliveries, parachutes will be attached to the delivery containers and they will be dropped from 120ft. The present steel masts of the ground stations will be replaced with ones having bamboo tops in order to reduce damage in case of accidentally striking one of them.



LIFTING POWER : The Armstrong Whitworth Whitley, with two Rolls-Royce Merlins, has an excellent take-off, even in the overload condition.

A WHITLEY BOMBER STATION

Formidable Aircraft : Tough and Cheery Airmen

By MAJOR F. A. de V. ROBERTSON, V.D.

(Photographs by "Flight")

IF it is fitting that a night bomber should look sinister, then the Whitley is the most appropriate of all aeroplanes. It is grim, most undoubtedly grim. Full face or profile, perhaps even more so in profile, its aspect threatens. There is nothing of the "We don't want to fight, but by Jingo if we do" spirit about the Whitley. One cannot picture it ever wanting to do anything else but plough its way relentlessly through the night to deal out havoc to whatever threatens the security of its country.

The Merlin-engined Whitley is not only relentless but quite fast, and it will go on flying more than halfway across Europe and back again. And if any saucy enemy fighter should try to interfere with its progress, well, it has gun turrets and its men know how to use them. But such a conflict of dignity and impudence does not happen very often.

The sight of a Whitley turns one's thoughts to the history of the heavy bomber movement in the Royal Air Force. The father of all heavy bombers, not in aeronautical lineage, but in tactical conception, was the Handley Page O/400, which did a lot of useful night bombing in the last war, both for the Dover Patrol of the R.N.A.S. and for the Independent Air Force. Next one remembers the Vickers Vimy, which might have bombed Berlin in 1919, but instead made the first direct crossing of the Atlantic. The four-engined Handley Page V/1500 bombed Kabul in the last Afghan war. The Vickers Virginia was for long a beloved machine of the night bombing squadrons, but, if my memory is correct, it never dropped a bomb in anger. Its cousin, the bomber-transport Victoria, is famed not for bloodshed but for rescue work, as it (in some numbers) brought the British Legation and other British and foreign people safely down from Kabul during the rebellion of 1928. There were others which we do not particularly need to remember, and we may reckon ourselves fortunate that, if war had to come, it came when the Bomber Command was possessed of a goodly supply of A.W. Whitleys. At the same time we offer our hearty thanks to the Rolls-Royce Merlin engine.

To visit a heavy bomber station is an experience which would convert even the deepest dyed pessimist. The pilots and their air crews are a tonic. They are young, for in war all fighting Services, and especially the Air Force, tend to grow younger on an average than they are in time of peace. Casualties have something to do with this, but the losses of the Air Force have not so far been heavy. It is

IN THE BRIEFING ROOM : A navigator turns instructions into degrees.

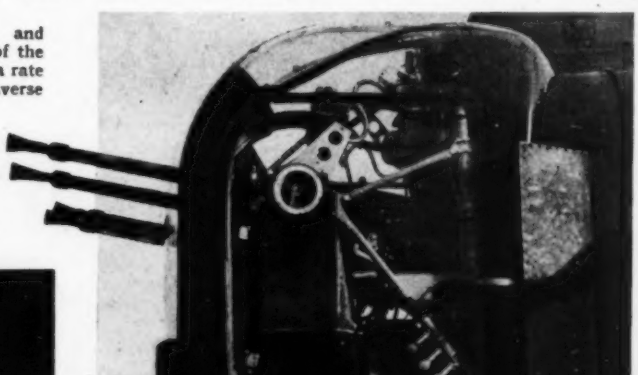
A WHITLEY BOMBER STATION (CONTINUED)

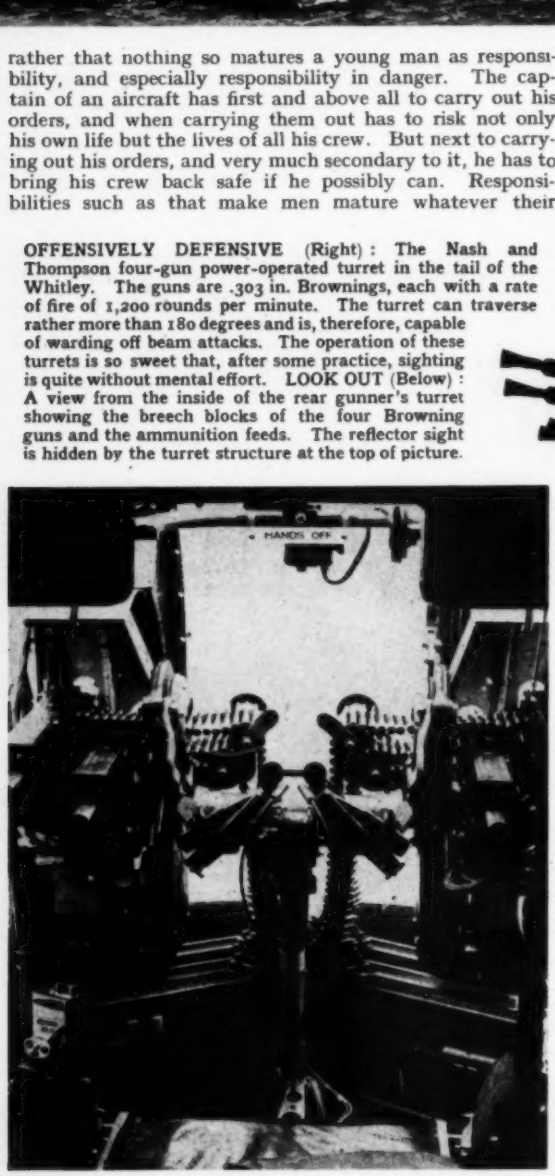
OVERHAUL : The efficient devotion of ground crews and excellence of material is responsible for the trouble-free journeys made each night. Despite the number of calls on our bomber force, nothing is skimped or left to chance.

rather that nothing so matures a young man as responsibility, and especially responsibility in danger. The captain of an aircraft has first and above all to carry out his orders, and when carrying them out has to risk not only his own life but the lives of all his crew. But next to carrying out his orders, and very much secondary to it, he has to bring his crew back safe if he possibly can. Responsibilities such as that make men mature whatever their calendar age may be. Moreover, a man who has made ten raids into the heart of enemy countries can reckon himself an experienced aircraft captain, one qualified to restrain the impetuosity of younger pilots. In age they may not be much younger than he is, but if the junior man has only been on a couple of raids he is infinitely the younger in all that counts nowadays.

These experienced young men do not carry their precocity (if they will excuse the word) into the officers' mess. Life in the ante-room is much the same as in peacetime, comfortable and apparently carefree. The wireless blares out its jazz or other music, papers are read, officers sprawl comfortably in deep armchairs, groups talk flying shop as flying men inevitably will do when they forgather, and only the sprinkling of purple and white ribbons in oblique lines on a number of the tunics tells the visitor that these men have shown gallantry in the face of deadly danger. Last night, perhaps, some of them were over Berlin, dodging their way through the *flak*, calmly and almost at their leisure identifying their targets, working their scientific instruments with quick precision, and loosing their load of destruction on the specified objective. To-night, perhaps, others of them will be doing that same serious job, but it never disturbs them. They take the prospect as calmly as a motorist contemplates a drive through difficult traffic. Perhaps the air gunners most aroused my sympathetic admiration. The majority of them are airmen—sergeants or corporals—but at the station which I visited lately there were a number of officers wearing the honourable badge of the single wing with the initials

OFFENSIVELY DEFENSIVE (Right) : The Nash and Thompson four-gun power-operated turret in the tail of the Whitley. The guns are .303 in. Brownings, each with a rate of fire of 1,200 rounds per minute. The turret can traverse rather more than 180 degrees and is, therefore, capable of warding off beam attacks. The operation of these turrets is so sweet that, after some practice, sighting is quite without mental effort. LOOK OUT (Below) : A view from the inside of the rear gunner's turret showing the breech blocks of the four Browning guns and the ammunition feeds. The reflector sight is hidden by the turret structure at the top of picture.





A WHITLEY BOMBER STATION (CONTINUED)

TO BED FOR THE DAY: Putting the weatherproof covers over the front gunner's and bomb aimer's cockpits. The machine is shown at its dispersal point on the aerodrome, where, when not in use, it rests in order to minimise the effect of any attack on the aerodrome.

"A.G." One or two of those men wore also the medal ribbons of the last war, and were therefore not youngsters. The normal complement of a Whitley's crew is: 1st pilot, who is captain of the aircraft; 2nd pilot; observer (who is navigator, front gunner and usually bomb-aimer); wireless operator; and rear gunner (who is usually under training to become a wireless operator). An officer air gunner need not be a wireless operator. His proper function is to control the fire from a formation, but night bombers do not fly in formation. The rear gunner sits by himself in the rear turret, and though he can speak to the rest of the crew on the inter-communication set, he must feel lonely on long night flights. If a Messerschmitt attacks the Whitley (such things have been known to happen) the rear gunner fights all by himself. Perhaps this loneliness and boredom can be more philosophically endured by an older man than by a youngster, but that I cannot say for certain, and it must be hard for even the captain of an aircraft to judge a point like that. At any rate, the officer air gunners in the anteroom bore no appearance of nerve strain. In fact, the whole bunch, for all their cheeriness, were undeniably tough. To be tough and cheery at the same time is a very happy combination. It indicates men who, as the Dutch Admiral said of the English sailors after a hard naval action, may be killed but cannot be beaten. That is why I said that a visit to a bomber station was an optimistic experience.

The authorities do not play fast and loose with the nerves of these gallant fellows. The men despise danger, but all the same, constant risks must have a wearing effect on the nerves of any civilised human being. It would be false economy to keep these men at their dangerous job until their nerves, in spite of themselves, began to fray. Before there is any chance of that happening, the crews are transferred to other jobs. The pilots probably become instructors for a time, the air gunners go up for their examination to qualify as wireless operators, and so on. So the crew which has flown together and fought together until it was like a well-trained football team gets broken up. There is an element of sadness in this, but the process is based on wisdom. In time the whole personnel of the squadron is changed, but the spirit of a squadron will survive changes of personnel. There is also a spirit and a tradition in the Group of which the squadron is a part, and likewise in the station on which two or more squadrons live together and share mess life and flying work. One officer remarked to

BOMBING-UP (Above): With bomb traps open and "hockey sticks" in position, the party of armourers start loading up the Whitley. The streaks on the airscrews are from whitewash which has been used to test the flow of de-icing liquid thrown out from the hubs. Leading edges of the wings and tail unit are kept free of ice by the Goodrich device which, by continual pulsating, breaks the ice adrift before it has time to get to dangerous proportions.

TEMPORARY LODGINGS (Right): A 500-lb. bomb being loaded into the bomb bay of a Whitley. The hand-fitted hoists which are shown lifting the bomb are known in the Service as "hockey sticks" because of their shape.

EARLY MORNING : Against a rising sun the last man home arrives back at the aerodrome. With legs stretched and flying kit removed the air crew will soon be eating a well-deserved breakfast.

me: "This is a Group for which you feel that you simply must do the best that is in you." There is friendly rivalry between the stations, and I was told some tales of inter-station rags which proved that it is only in their work that these officers are older than their age.

I have no doubt at all that the German Intelligence Department knows the whereabouts of the Whitley stations, but if they have any doubts I have no intention of helping to solve them. It gives no secrets away to say that aerodromes are usually in flat country. To drive about that country on a fine October morning is a very pleasant experience. On the day of my visit the country-side looked very lovely and peaceful. Even a patriotic Scot in such surroundings could hardly quarrel with the egotistical boast, "There'll always be an England." Well, there'll always be a Scotland, too, and one would be a very sorry place without the other. And in the ante-room I saw a uniform which suggested the thought, "There'll always be a New Zealand" as well. One could not imagine the Empire without a New Zealand, though no doubt such a prospect would be very much to the taste of the Germans.

1914 and All That

To give a few details about one of the squadrons on the station which I visited: it succeeded to the records and number of a Home Defence squadron which was raised at Thetford in 1916 and was equipped with the B.E.2c, B.E.12, F.E.2b and Avro. In 1919 it operated from Sutton's Farm, in Essex. In 1937 it was reformed, and to begin with was given Ansons and Virginias to practise with, until Whitleys were provided in 1938. In the early days of the war the squadron did a lot of what the pilots called "nickel raids," namely, dropping pamphlets. Whatever the value of the pamphlets may have been, there is no doubt that the practice which the flights gave in flying over Germany in wintry weather has since stood the crews in very good stead. On one occasion machines of the squadron started from Villeneuve for Stuttgart and ran into very bad weather. Thick ice formed on the wings, and one machine found the air intake of one engine frozen and had to make a crash landing. Another one was abandoned altogether." The curious thing was that when the crew of one was ordered to take to their parachutes, the rear gunner did not get the order (inter-communication sometimes fails) and came down to earth as the only occupant of the machine. Except for a few scratches, he was quite unhurt. Incidentally, one of the airmen who did escape from that machine, a corporal wireless operator, won the Distinguished Flying Medal last May.

This squadron took part in quite a number of security patrols over the Frisian Islands, and in March last it sent seven machines to take part in the great raid on Sylt. It was the first occasion on which the squadron had dropped bombs. They bombed from heights varying from 13,000 to 1,000ft., and one of the squadron's machines was shot down. Two others were badly hit. One Squadron Leader (in a heavy bomber squadron that rank indicates a flight commander) was awarded the Distinguished Flying Cross for the gallant part he played in that raid.

The next phase of the squadron's operations was a series of reconnaissance flights over the Ruhr and other places, on which no bombs were dropped. In April the squadron took part in the Norway campaign and bombed the two aerodromes outside Oslo. Aalborg aerodrome in Denmark was also one of its objectives, and there it lost another machine. In May it started serious operations on the Ruhr and other places, being ordered to pay chief attention to oil refineries. When the war shifted to Belgium and France the squadron was turned on to destroying bridges and other means of communication at the rear of the German armies. After the surrender of France, targets in Germany became the regular objectives for the squadron, though occasionally

WHITLEY BOMBER STATION (CONTD.)

INELEGANT EFFICIENCY: Even with its wheels retracted this Armstrong Whitworth Whitley is not a thing of beauty, but it is a very excellent bomber. The crews all speak most highly of it as an aeroplane, as a bomber and of its ability to fight off attacks and take punishment. The excrescence on top of the fuselage is the direction-finding loop aerial.

their machines have been sent against the invasion ports. That, of course, means a short and easy trip for the crews, but does not quite satisfy their conception of the dignity of a heavy bomber.

In June last this squadron and another sent a number of Whitleys to bomb the Fiat works at Turin. The weather was very bad during that trip. The machines climbed to 18,000ft. as they flew beside Mt. Blanc, and the crews got some fine Alpine views despite the generally bad weather. The defences of Turin seemed to be taken by surprise, and with such a number of bombers overhead at the same time, the A.A. gunners did not seem to know where to aim, and consequently their fire was very erratic. In July the squadron did a raid on Kiel.

The crews have a considerable respect for German *flak*, but they say that German searchlights are not so efficient as ours. They know the ways of the *flak* gunners by now, and are able to turn their knowledge to good account. In this, as in other things, experience tells.

On one raid over Germany a Whitley got into a spin, and the pilot ordered the crew to take to their parachutes. The 2nd pilot promptly obeyed and was taken prisoner of war. Then suddenly the 1st pilot regained control, and brought the rest of his crew safely home. Later on, however, that 1st pilot was himself shot down in Germany and made a prisoner of war. The squadron is wondering if he has met the second pilot in prison, and, if so, what they said to each other.

The merit of the squadron's work may be briefly summed up by saying that up to date, which means in little over a year of war, five D.F.C.'s and four D.F.M.'s have been conferred on members of the squadron.

MODERN MAINTENANCE in U.S.A.

600-Hour Engine Overhauls on Twin Wasps

THE advances which have occurred in maintenance work are at least as spectacular as those belonging to the other branches of air transport. Perhaps they are even more so, for it is a far cry from "the bad old days" of the 1920s, when the pilot *hoped* his engine would go, to the precision maintenance of to-day when he *knows* it will—until the next overhaul is due and it is dismantled remorselessly, though it may be going as sweetly as it did when newly turned out of the factory.

An article on the maintenance methods used by United Air Lines appears in the September issue of *Aviation* and some of the features mentioned in it are of great interest. Transcontinental air mail flying in U.S.A. has just completed twenty years of service to the nation and the temptation to look back down the years cannot be resisted. In 1920 the American-built DH 4 was used to carry the mail and was fitted with a Liberty engine. Spark plugs and distributor heads were changed after every trip and the engine was given a complete overhaul after 50 hours. Later, this period was increased to 100 hours.

But the Twin Wasps of United's Douglases in this year of 1940 are so reliable that they are allowed to go 600 hours between complete overhauls. This work is done at Cheyenne, and after the Douglas DC 3 is rolled into the hangar, overhead stands are lowered alongside the pilot's cockpit and work benches on wheels are moved up to the engines. Hydraulic testing equipment is also arranged on a portable bench for efficient working.

Inspection is done by three inspectors to each aeroplane and more than 500 items have to be checked. On the airframe all inspection doors are opened, and where there are none the inspector uses a small tool consisting of a suction cup on the end of a handle. With this he tests the "feel" of the structure and with it can detect a cracked internal member, such as a rib.

All instruments are tested, some requiring removal from the aeroplane for this purpose. At the same time all electrical, hydraulic and control systems are checked for functioning.

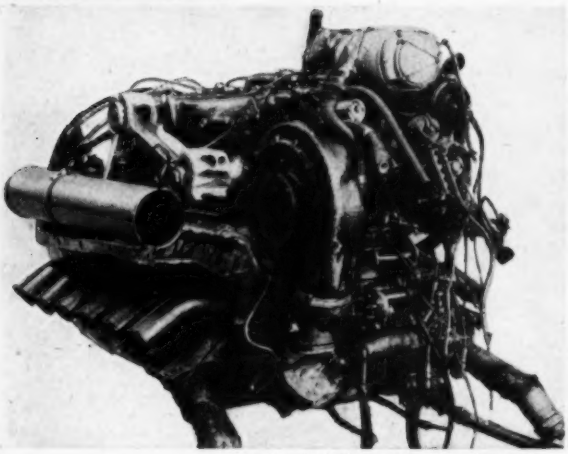
The engines are removed from their mountings and completely dismantled. After cleaning, all parts are inspected and steel parts are examined for cracks by Magnaflux. When rebuilt, the engine is run for 4 hours in the engine test room. Later, it is given a test flight before being pronounced ready for service. For the 600-hour check the aeroplane is usually in the hangar for 48 hours.

At 5,000 hours the major overhaul of the whole aeroplane occurs and this seems to correspond to the British annual C. of A. inspection. Engines, wheels, instruments, wings, tanks, control surfaces, seats and other cabin furnishings are removed and thoroughly overhauled—in fact, the procedure is as for our C. of A.

The division into "shops" at the Cheyenne base is as follows: Engines, airscrews, accessories, instruments, radio and electrical, sheet metal, machine shop and battery shop. Much of the test equipment was built by the United machine shop so that the base would have exactly the right equipment for its needs. This includes a hydraulic tyre remover, a machine for lapping piston rings, a brake drum grinder, hydraulic test benches and power jacks.

The machine shop staff consists of 29 men and they have 6 grinders, 8 toolmaker's lathes, 2 turret lathes, 1 shaper, 2 milling machines, 1 two-spindle drill press and tapping machine, 2 large drill presses, 1 drill grinder, 1 shaping saw and 1 radial drill. There are also an 18 by 18 by 40 electric heat-treatment furnace and a Rockwell hardness tester. In the sheet metal shop there are two drop hammers for shaping sheet for fuselage, wing and tank repairs. All the Boeing 247 jigs have been turned over to United by the Boeing Company when it discontinued the manufacture of this type, as the airline company still has 50 of this famous model in its fleet.

Enemy Aircraft—V.



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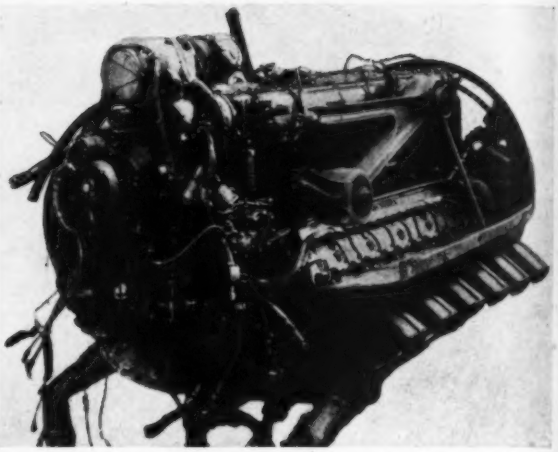
Rear view on the port side of the DB 601A. The air intake arrangements and the absence of ejector exhausts indicate the engine is out of a Heinkel He 111K.



In this view of the starboard side more details of the engine mounting can be seen. This is a magnesium alloy forging. The header tank for the cooling fluid will also be noticed at the front of the engine.

AN INVERTED VEE ENGINE

The Mercedes-Benz DB601A : Hydraulic Drive to Supercharger : Clockwork Boost Control : Roller Bearing Big Ends

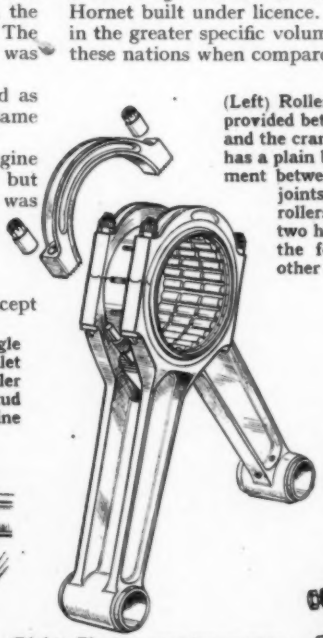
GERMAN military aircraft engaged upon the operational work of fighting or bombing are now exclusively equipped with petrol-injection engines, and the carburettor has been discarded. The carburettor is retained on the smaller engines used in trainers and some of the other non-operational types, but the preference for the injection system is most marked, probably on account of fuel economy and freedom from icing trouble. In the early months of the war carburettors were still in use. The direct-injection system on the Junkers Jumo 211A was described exclusively in *Flight* of January 18, 1940.

Either Mercedes-Benz or Daimler-Benz may be used as the name for the DB 601A engine; they refer to the same design made in different factories.

The inverted-vee type, of which this 12-cylinder engine is an example, is very popular in German design, but radials are also in use, and the Bramo Fafnir, which was previously a carburettor engine, now has petrol injection and is fitted to Dornier Do 215s. This engine has not the hydraulic supercharger drive of the DB 601, but has a two-speed supercharger.

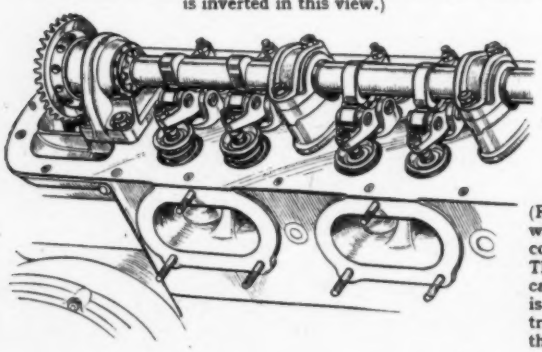
The DB 601A is basically similar to the DB 600, except that the single-speed supercharger and pressure carburettor have been replaced by the very interesting hydraulic drive and the injection pump. (The DB 600 was described, with other German engines, in *Flight* of November 16, 1939.)

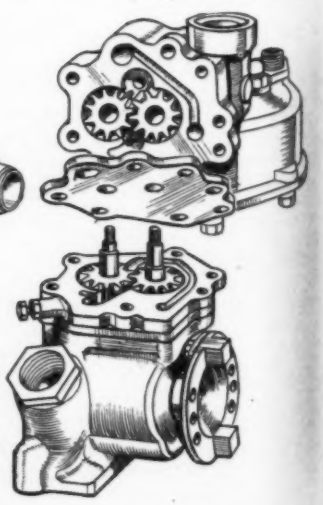
German aero-engine design has been influenced by American, this being partly due to the fact that the B.M.W. 132 radial was the 9-cylinder Pratt and Whitney Hornet built under licence. The influence appears mostly in the greater specific volume used by the designers of both these nations when compared to British designing practice.



(Left) Roller bearings (three rows of 24) are provided between the forked connecting rod and the crankpin. The other connecting rod has a plain bearing to take the relative movement between the two big ends. Serrated joints, with the splines parallel to the rollers, ensure perfect alignment of the two halves of the split race. Though the forked rod has splined nuts, the other rod has the usual hexagonal type.

(Below) The underhead valve gear is driven by a single camshaft, each cam operating one exhaust and one inlet valve, there being four valves per cylinder. Needle roller bearings are incorporated in the rockers. The three-stud attachment of the exhaust stubs will be noticed. (The engine is inverted in this view.)





(Right) The two gear-type pumps which deliver oil to the hydraulic coupling of the supercharger drive. The lower one delivers its full capacity constantly but the upper is governed by an altitude-controlled capsule which is housed in the right of the body of the pump.

A comparison of the take-off power of our Rolls-Royce Merlin X with its capacity of 27 litres against that of the DB 601A with the considerably larger capacity of 33.9 litres is revealing. The Merlin rating gives 1,065 h.p. for three minutes at 5¾ lb./sq. in. boost and 3,000 r.p.m. The DB 601A rating is very similar, being 1,050 h.p. for one minute with a boost of 5.2 lb./sq. in. at 2,400 r.p.m. The difference in capacity is, of course, most marked.

Hydraulic Coupling

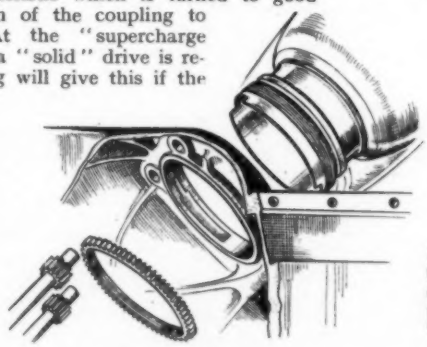
What is undoubtedly the most interesting feature—it is believed to be unique—is the fluid drive to the supercharger. This hydraulic coupling operates on the principle of the "fluid flywheel" well known in automobile engineering. Under this system power is transmitted from driving to driven member by the continuous circulation of oil in the curved channels of both members.

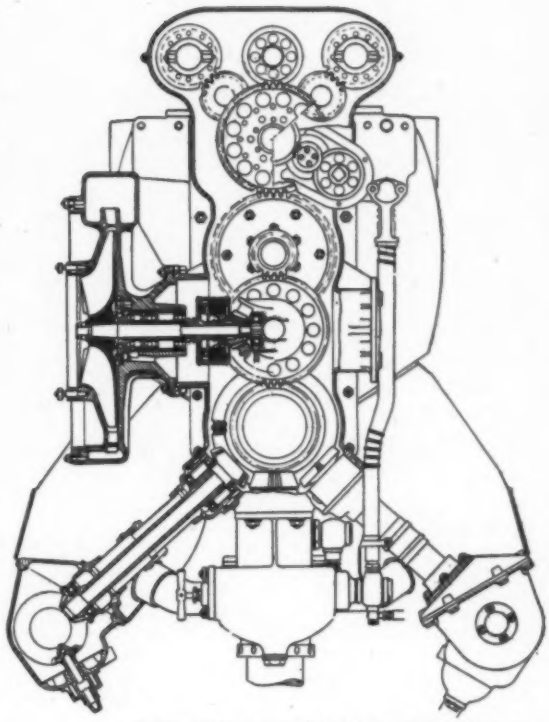
In the drive of the DB 601A, oil is pumped along a passage A in the shaft of the driving member (the other end of which runs in a spigot bearing) and then emerges through the radial holes of the shaft B into the radial passages C of this member. The rotation causes it to flow outwards, and the shape of the passages is such that the oil is directed into the similar passages D of the driven member. As it has a component of tangential velocity it impinges on the vanes and so drives the member round.

The fluid, in going from driving to driven member, must cross the small gap between them, and a certain loss of fluid occurs continuously. Hence the need for pumping the oil into the coupling. Slip between driving and driven members is always a characteristic of hydraulic couplings, but this decreases with increase of speed and is also affected by the amount of oil in the passages of the coupling.

It is this last characteristic which is turned to good account in the adoption of the coupling to supercharger drive. At the "supercharge altitude" of the engine a "solid" drive is required, and the coupling will give this if the oil passages are kept filled. (This must be qualified by saying that hydraulic drive is never quite "solid," the minimum of slip never being lower than 2 or 3 per cent.)

Below the supercharge height it is desired to run the supercharger at lower

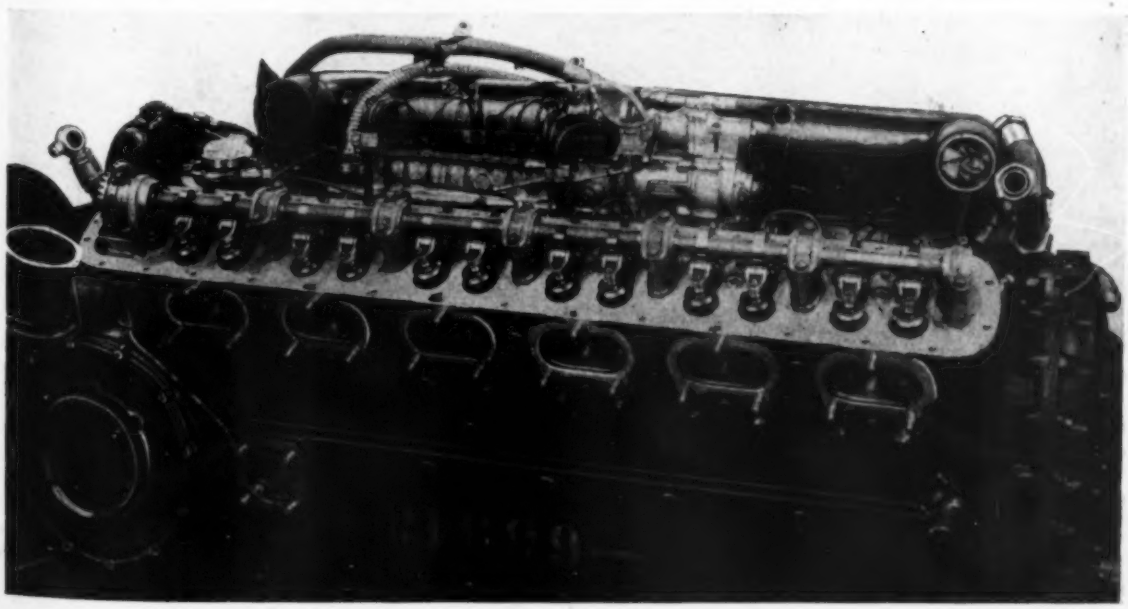




The supercharger of the DB 600 will be seen in this drawing. The DB 600 was the forerunner of the DB 601A and has the same dimensions, but lacked the hydraulic coupling.

(Left) The "dry" cylinder liner is attached to the cylinder block by a screwed joint. At its other end the liner is retained in the crankcase by a ring nut which is tightened by means of one or two of the tools shown. When rotated in the holes in the crankcase, the pinion of the tool engages with the gearing on the ring nut.

(Below) The Mercedes-Benz DB 601 A inverted vee-twelve engine is seen here in the upside down position during maintenance work at an Air Ministry station prior to testing. The bank of injection pumps, the valve gear and the supercharger will be noticed.

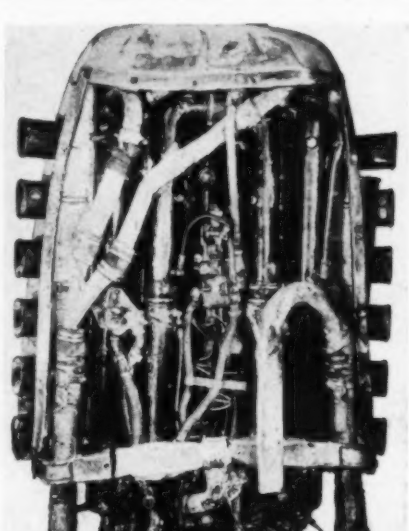


AN INVERTED VEE ENGINE (CONTINUED)

speeds in relation to the engine, and this is accomplished by reducing the oil supply to the coupling. A two-stage pump supplies the coupling from the main pressure oil filter, each pump stage being of the normal gear design. The first stage has no control on it and supplies the whole of its output to the coupling, so that there is always some oil present in the spaces. The output of the second stage is governed by a capsule which responds to intake pressure, so controlling a piston valve which divides the oil between the coupling and the by-pass back to the engine sump. The second stage commences delivery to the coupling at a barometric height of 4,900ft., and full delivery occurs at 11,500ft. approximately. In this way is the desired result of a variable-speed drive between engine and supercharger obtained.

On the Mercedes-Benz the hydraulic coupling is a double-sided one, the driving member being on the inside with one driven member on each end. End thrust is thereby balanced. The inner parts of the hydraulic coupling are light-alloy die-castings. The annular rings of curved section, which are attached to the radial vanes and so help to form the correct shape for the fluid channels, are not part of the die-casting. They are separately made and pinned to the vanes, this form of construction simplifying the die-casting considerably.

The clearance between the inner driving unit and the outer driven casing is very close. The slots on the inner unit probably serve to aid lubrication. The driven casing is of steel, ribbed on the outside to give strength with lightness.



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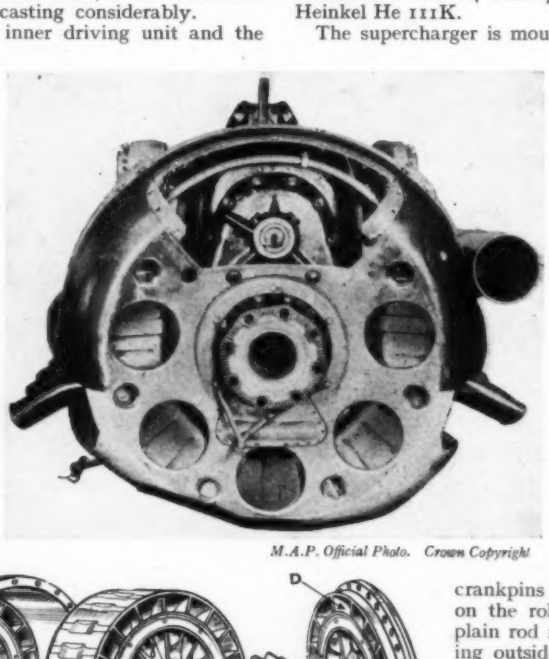
View of the underside of a damaged Mercedes-Benz DB 601A. The injection pumps lie in between the two banks of cylinders.

A capsule-controlled butterfly throttle controls the supercharger delivery, and a second throttle, operated by the pilot, controls the air supply to the engine, and therefore the induction manifold pressure. The capsule controlling the first throttle is subjected to the pressure between the two throttles.

Worthy of note is the clockwork mechanism which permits the boost to be increased for one minute only at take-off. The German boost gauge is marked, not in kilogrammes per square mm. or millimetres of mercury, but in tenths of an atmosphere. The dial shows from 0.6 to 1.8, which limits are much wider than those which can be reached. It has been reported that the Mercedes-Benz has run up to 1.45 atmospheres (+6.3 lb./sq. in.) and 2,500 r.p.m. for take-off, but this seems very high and the claim has not been substantiated. The highest figure seen on a machine by Air Ministry technicians was 1.4 atmospheres (+5.6 lb./sq. in.) on a Heinkel He 111K.

The supercharger is mounted neatly on the port side of the engine, with its axis at right angles to the crankshaft. This necessitates bevel gearing for the drive (which has a ratio of 10.39 to 1) but allows the air intake to be of neat design with merely one right-angle turn, well louvred to minimise eddy loss.



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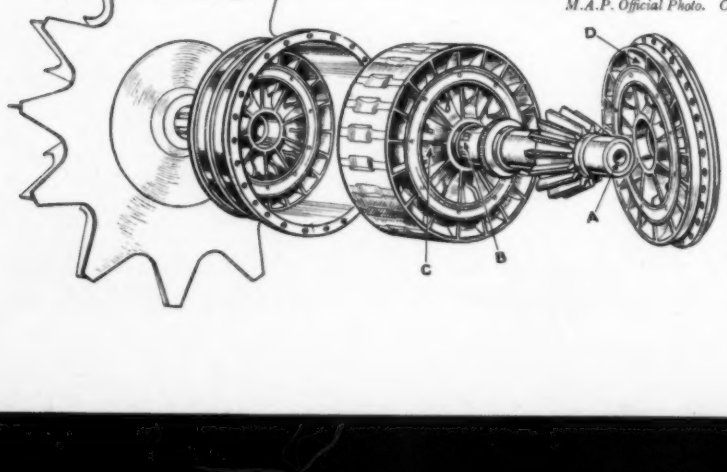
(Right) The front view of the DB 601A shows the splined flange for the attachment of the airscrew hub, and the horseshoe-shaped header tank under the cowling. The air intake is on the right.

(Below) The hydraulic coupling driving the supercharger. Oil is supplied to it through the hole A and then passes out of the shaft B through small holes to the curved passages C of the driving member. By centrifugal action it is flung into the passages of the driven member D and so causes it to rotate. The arrangement is duplicated on the other end, so balancing end thrust.



Big-end Roller Bearings

The big-end bearing of the connecting rod shows considerable enterprise in design, roller bearings having been used. This has three tracks of 24 rollers each, running on the crankpin and in steel split outer races, with a split light alloy cage. Serrated joints are used as shown in the drawing. At each of the crankpins there is one forked rod running on the roller race, while the other is a plain rod running on a lead-bronze bearing outside the race. In the small end bronze bushes are fitted. An unusual type of nut is used on the forked rod. Instead of having hexagonal flats, the nut is of circular form with numerous splines. The first explanation that this was for ease in tightening up the nut by small amounts does not seem to be the correct one, as hexagonal nuts are used on the bolts of the other rod. Lubrication

AN INVERTED VEE ENGINE (CONTINUED)

of the big end is by forced feed to the roller bearings and then out to the plain bearing.

Cylinder Liners

The cylinder liners are of the "dry" type made of steel. By their tension they hold the surrounding light alloy cylinder blocks into the crankcase. The attachment to the crankcase is made by a screwed joint with a large ring nut. On the outside of this are cut gear teeth which engage with the tool used to screw up the nut. This might be described as a screwdriver with a small gear pinion instead of a blade. A spigot on the end of this tool is inserted into a hole in the casting and the tool rotated. This turns the ring nut and so tightens it. Considerable mechanical advantage is available for tightening, and two such tools can be used simultaneously if required. The crankcase is a light-alloy casting with well designed reinforcing webs. The thin light-alloy top is dowelled and secured by numerous small studs.

The above arrangement of cylinder liner is different from that adopted in the Rolls-Royce Merlin, which employs "wet" liners and does not utilise the liner as a means of attachment for holding cylinder block and crankcase together. Instead, a number of long steel bolts perform this function. The Merlin design seems superior, and the provision of an easier path along which heat may flow from the cylinder through the "wet" liner no doubt is part of the reason why specific power output is higher.

Unlike British designs, these Daimler-Benz engines are water-cooled. Glycol is used in the cooling fluid in the proportion of 30 per cent. Glycol, 70 per cent. water for bombers, and 50-50 for fighters, but the operating temperature has not been raised because of this. The addition of Glycol appears to be for anti-freeze purposes only.

To each block of cylinders there is only one camshaft. Each cam operates two valves, an inlet and an exhaust. There are two inlet and two exhaust valves to each cylinder. Between the stud on the rocker arm and the end of the tappet is a floating spherical joint. Rocker arms have needle roller bearings, and tappet adjustments are most accessible. The whole valve gear is very well arranged.

A Bosch magneto is fitted to the DB 601A, this being a twin ignition unit with two electrical circuits but only one drive from the engine, so not true "dual ignition." This is not universal German practice.

Injection Pumps

Before going to the injection pumps the petrol goes through the de-aerator, which is interposed between the fuel pump and the injection pump. The injection pumps are of Bosch type, the twelve being arranged neatly in line in four groups of three. They operate in exactly the same way as the Junkers pump on the Jumo 211A, but they are mounted in a more accessible manner.

The injectors on the DB 601A differ from the Junkers type, which is simply a nozzle designed to admit the charge to the cylinder in a finely divided state. But the type which Mercedes-Benz fit is not only a nozzle but is spring-loaded to act also as a valve.

All German engines for military operation have been found to contain 92 octane leaded fuel in the tanks. This grade of fuel is used for take-off and all other conditions of flight. But the DB 601A was designed for 87 octane, so higher-grade fuel is apparently not yet short.

The German method of attaching the airscrew to the engine differs from the parallel splining of the shaft used as standard in this country. Their method adopts flange-mounting in preference to shaft-mounting, and carries the drive to the airscrew hub by two plates bolted together, the load being carried through radial serrations on the faces of the plates.

A large number of German engines have been captured and are available for test and experiment in the engine laboratories of the Air Ministry. Some of them have had very few operational flying hours, even as low as under ten. And many are of recent date of manufacture, the name plate of one out of a Messerschmitt Me 109 indicating that it was made in the first half of this year.

The standard of workmanship seen on the details of the Mercedes-Benz engines which have been captured can only be described as excellent. Also the arrangement of piping is very neat and some thought has been expended on the placing of accessories. But whether this has been entirely successful is doubtful, for as one observer described it, they appeared to be "regimented." Mercedes-Benz design is not so heavy in appearance as Junkers.

The designers appear to have gone in for simplicity of appearance, sometimes at the cost of the general excellence of the engine. They do not seem to have equalled Rolls-Royce and Bristol in the finesse and artistry of design.

Power-Weight Ratio

The particular engine inspected had not been power-tested on the brake, but it was expected to give within about 40 h.p. of the rated powers. Using the take-off rating of 1,050 h.p. and the weight of 1,610 lb., the power-weight ratio is 1.53 lb./h.p.

The take-off power of 1,050 h.p. is lower than the figure which has been accepted previously and which *Flight* has published as 1,150 h.p. But after careful examination, Air Ministry technicians state that they can find no evidence of the engine being used at take-off powers higher than this.

Other data on the engine are:

CONTROL: Single throttle control from pilot's cockpit.

BORE AND STROKE: 150 mm. × 160 mm.

STROKE VOLUME: 33.9 litres.

COMPRESSION RATIO: 6.9/1.

REDUCTION GEAR: Spur type, 14/9.

THRUST BEARING: Normal ball type.

WIDTH: 29.1in. LENGTH: 67.5in. HEIGHT: 40.5in.

WEIGHT: Oily, with fuel pump, generator, hydraulic pump, starter, airscrew control gear, piping and wiring to bulkhead: 1,610 lb.

CRANKSHAFT: One-piece type, with six cranks at 120 deg. and eight balance weights each consisting of two plates riveted on each side of a crankweb extension. Runs in seven lead-bronze bearings. Front end splined to take splined mounting sleeve of reduction gear pinion. Rear end fitted with starter dog and accessory drive.

BIG-END BEARING: Roller type with three tracks of 24 rollers each, running on crankpins and in steel split outer races, with split light-alloy cage, with serrated joints.

PISTONS: Light alloy of normal design, floating gudgeon pin. Three compression rings and two scraper rings.

VALVE GEAR: Bevel drive to camshafts. Single underhead shaft on each block, with one cam operating one inlet and exhaust valve, through rocker arms with needle roller bearings.

VALVES: Hollow stem, exhaust valve sodium cooled.

SPARKING PLUGS: Two per cylinder, fitted on outside of block.

INJECTION PUMP: Bosch twelve-cylinder in-line type, fitted between cylinder blocks, and controlled by induction manifold pressure sensitive diaphragm, altitude pressure sensitive capsule stack, and induction temperature sensitive capsule. De-aerator interposed between fuel pump and injection pump.

MAGNETO: Bosch twin unit, Z.M.12 B.R.4 type.

AUXILIARIES: Mounted on gear box at rear end; gear-type fuel pump, 24-volt, 1,500-watt generator, swashplate driven six-plunger hydraulic pump (alternatively, vacuum pump), centrifugal coolant pump, and hand/electric inertia starter.

OIL PUMPS: Gear-type pressure pump delivering through wire-wound filter. The main oil supply is led by drilled crankcase passages to the main bearings. Scavenge oil drains from front and rear to the camcase covers, in each of which is a gear-type pump.

POWER: Take-off, 1,050 b.h.p. at 5.2 lb./sq. in. boost and 2,400 r.p.m. (limited by clockwork to 1 min.).
For 5 min., at ground level, 950 b.h.p. at 3.75 lb./sq. in. and 2,400 r.p.m.
Power at altitude, 970 b.h.p. at 2.4 lb./sq. in. and 2,300 r.p.m. at 12,000ft.

OIL COOLER: The cooler area is increased by 50 per cent. in order to dissipate the energy not transmitted by the supercharger hydraulic coupling at maximum slip.

EXHAUSTS: Ejector-type exhaust stubs are fitted when the engine is installed in the Me 109.

Air Strategy—XXVII

U.K. as ADVANCED STRIKING BASE

This Isle is Nelson's Ship To-day

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

THE most elementary and the most important requirement in war is the possession of a secure base. The object of all blockade is to undermine the base of the enemy. If the base becomes the front line all strategy is hampered. Sea blockade is slow; it does not turn the enemy base into the front line.

Compare that method—Britain's traditional method—with the method of Germany in this war. Each conquest by the German forces—in Poland, Norway, Holland, Belgium, France—has been won by striking at the base of the immediate opponent to make it crumble behind the front line, and so cause the front line to fall back into the base and inevitably bring about confusion there.

This is, for British naval and military leaders, a new strategical conception of war. Most of them still do not appear to have grasped its true significance. They still sigh for the clash of fleets and armies according to tradition on the high seas and on old-fashioned fronts. Can't they see that by doing so, or by preparing to do so, we are playing into the hands of the enemy? It is the easiest way to dissipate our energies, and the surest way to lose the war.

Can't our leaders see that we can only win this war by smashing the main base of the enemy—Germany, and its subsidiary base, Italy? Can't they see that the only way to do that is from the air? The United Kingdom should no longer be regarded as the Allied main base, but as the Allied advanced striking base. That is the true conception of the British Isles to-day.

Far-fetched

At the beginning of 1939 I wrote a book which no publisher would publish because they thought it was too far-fetched. In that manuscript I visualised that, as a result of the coming war in Europe, the continent of Americas might be involved in actual warfare in the Western Hemisphere. I suggested that unless the United States of America were prepared to consider their frontier as reaching out to the coastline of the mainland of Europe and Africa they might well find themselves fighting European invaders of South America on the borders of Mexico. The manuscript visualised the certainty that, if Germany were to prove victorious in Europe, she would reach out to South America across the South Atlantic from Dakar, and that it would be difficult to prevent her forces from making a landing or a series of landings at points on the thousands of miles of unprotected coast of South America against which the South Atlantic rolls. None of the South American nations has either the population or the armies, navies or air forces to guard their long seaboards, nor have they the communications to rush reinforcements to threatened points.

I did not suggest that the American people of the United States would be involved in war immediately Europe was overrun. But I argued that if Britain were defeated, fighting on the mainland of the Americas would be but a matter of time. It might be ten years before the United States came up against the full force of the military power which would be arrayed against her, but I doubted it.

To-day it is well to consider the factors which might govern a situation such as that which frightened the publishing world of London out of the publication of my book nearly two years ago. At that time I suppose the publishers decided that there wasn't any money to be made out of a book like that, because after Munich the public wanted to be reassured rather than redismayed. To-day, grim probabilities can no longer be shelved. They must be faced and provided against beforehand if we are to survive, and if our cousins across the Atlantic are to survive.

Baldwin said years ago that our frontier was the Rhine. Brave words, wise words, but, unfortunately, only words. There were not the weapons to make the words into the actualities of deeds. There is a tag which runs: "After all is said and done far more is said than done." That was Britain's failing during the twenty years which preceded this, the second round in the world war.

Too Much Talk

During the half-time, which lasted from 1919 to 1939, we talked too much. Our politicians seemed to convince themselves that a speech in the Imperial Parliament of Westminster carried weight outside the British Empire. And they believed in the power of money. How often we heard that Britain's finances were sound, that we could stand the strain of a long war, which others couldn't. The war of 1914-1918 ought to have exploded that theory, for it was a favourite argument among economists of that day that a great war was financially impossible.

What all financiers forget is that the machinery of finance which functions in normal times doesn't function in war. And so far as Germany and Italy are concerned this war-state of finance was in action for years before the whistle blew for the end of half-time. Both Germany and Italy ignored the sovereignty of gold and wangled a way around its power. Now they are running the currency of nearly the whole of Europe in paper.

Europe's population, including the whole of Turkey, is something like 500,000,000. Of this total the populations of Germany and Italy and the countries they have overrun amount to nearly 300,000,000. Russia in Europe, and the countries Russia controls, have a population of about 118,000,000. The four remaining independent nations—Bulgaria (for how long?), Greece, Turkey (in Asia as well as Europe) and Portugal—account for 33,000,000. The United Kingdom, the Irish Free State and Iceland (which we have occupied) throw a total of about 49,000,000 into the scales. Even if we take the total white population throughout the British Empire, counting British subjects only, we can muster only 70,000,000.

White Populations

If this war, at its European end at any rate, is a white man's war, the proportions can be set out thus:

Germany and Italy 122,000,000 white population
British Empire ... 70,000,000 white population

That disproportion shows more clearly than can any other form of simple arithmetic why the frontier of the

U.K. AS ADVANCED STRIKING BASE (CONTINUED)

United States, and in fact of all the nations of America, is now on the coastline of the mainland of Europe.

To suggest that their defended frontier in the east lies along the chain of islands off the seaboard of North and Central America is to delude themselves as satisfactorily as the British people deluded themselves for the first five years, if not the first six and a half years, of Hitler's reign in Germany. America's frontier stretches as far east as does the Atlantic Ocean. It laps the shores of France, Spain, Africa, not to mention Holland, Belgium, Denmark and Norway. The Americans must take action to stop the war there if they are going to take action to stop it at all. How can it be done? I believe the best way to get the full benefit of American collaboration in the war is for America to use the same methods as the Nazis and Fascists. America should stay out of the war just as the Nazis and the Fascists stayed out of the civil war in Spain.

A *Civil War*

Looking at this war in a big way, it is no more than a civil war anyhow, if we consider Europe as the homeland of the white race. It is a factional war, a political war, first and foremost, yet it is not recognised as a civil war because we still cling to old ideas of frontiers which Germany and Italy refuse to acknowledge. Let not America make the same mistake as all the European nations have made, by hanging back until it is too late.

A German-Italian move is now under way to seize what remains of Europe, to put the whole continental mainland under their joint domination. They want to drive Britain out of the last possible bases in Europe's mainland from which our aircraft might operate. Clearly they believe that if we are left with Britain as the only base outside Gibraltar, Malta and Alexandria, our forces will have been rent asunder and can be dealt with separately. Probably they believe that the lines of communication between the two main British forces can be cut.

This is where the strategic position of the American continent bestrides the world situation. But it can function only if the American people realise that they are now facing what may prove to be their last opportunity to avail themselves of the latent strength which they possess. America isolated would scarcely have a chance of being able to assert herself. But America with advanced bases in the United Kingdom and in Africa stands in a very different position. America need only feed those outposts, so that they can withstand all assaults. By "feed" I do not mean provide foodstuffs only. I mean provide all the necessary materials of war.

U.S. Our Main Base

Whether we call it so or not, North America is now, in fact, the Allied main base. The enemy are trying to weaken the value of that base by seeking to reduce all the outposts of Europe. No matter. Let them do so. Their lines of communication will stretch out through lands whose people will grow more sullen and difficult to handle as the months of enemy occupation continue. Their need to maintain the armed control which is the only form of race compulsion which mankind will accept will weaken their home defence. So much the better.

The heart of the enemy still lies in Germany. There is the place where every punch must be landed. That is the spot which must be considered the strategic centre of enemy aggression. The only way in which that central heart can be laid bare is from the air. And to make that operation possible there is now only one striking base—the United Kingdom. If Greece is overcome, the United Kingdom is also the nearest striking air base from which to attack the subsidiary enemy base, Italy.

If I were an American, I would say that the advanced base that is Great Britain must be preserved at all costs. At all costs. If that base were to fall, the frontier of America is pierced. And then America must be thrown upon the defensive with the two greatest frontiers in the world to defend.

And would America be so sure that in such an event Russia would not throw in her lot with the Nazis, Fascists and Japanese? Wolves first hunt in packs, before they turn and rend each other. Beset from the North and South Atlantic, from the Pacific and through Alaska, America would indeed be in worse plight than Britain and the British Empire are at present. Much worse.

Yet America can save herself even now without (in my opinion) coming into the war as a belligerent. Indeed, I believe that she can do more good by remaining out of the war—to act in the same way as that by which Germany and Italy conducted non-interference in Spain. What Britain needs most is a safe arsenal and a guarantee of food supply. Both can be provided in the Western Hemisphere.

Evacuation on a Vast Scale

Next we require a safe evacuation zone, where our redundant population can be housed and fed with the least dislocation of Britain's war effort. That too, can be secured in the Western Hemisphere. Evacuation must be planned on a vast scale. The British Isles must be cleared for action as the deck of a ship is cleared for action. This isle is Nelson's ship to-day, this precious isle . . . Aye! Precious, not in the way that Shakespeare meant when he wrote his oft-quoted lines, but precious because it is the striking base for the Western Hemisphere. Too often Americans refer to Britain as the last outpost or bulwark. Wrong thinking produces such words. We stand not on the last outpost. We stand in the advanced striking base.

What has all this to do with air strategy? Much. Air action is absolutely dependent upon the possession of a secure base, sited in a position which permits striking action to be undertaken and continuously maintained.

With the R.A.F., the Navy and the Army we can guarantee the security of the British Isles indefinitely as an air base. With these isles secure as an air base Germany and Italy cannot win this war. Our air strength can increase, the striking radius of our bombers reach ever farther from these shores, our landing grounds multiply. The supply of personnel for the Royal Air Force is assured under the Empire Training Scheme, which I believe I was the first publicly to advocate.

But to-day our fighting isle and our capacity to outpunch the enemy in the air is encumbered by a redundant mass of people whose safety occupies far too much of the national effort. Britain ought to be relieved of that effort. Britain ought to be relieved of the need to provide food for them. Only the defence forces and those who tend them, the essential workers and those who look after them should be here to-day. Britain should be stripped for action.

(*Continued on page* 396.)

Washington's new airport at Gravelly Point, D.C., faces the Potomac River. When completed it will be one of the finest in the United States. The President laid the cornerstone of the terminal building recently. (See picture on opposite page.)

HERE and THERE

Trans-Canada Buys Lodestars

TRANS-CANADA AIR LINES has recently added to its fleet, which previously consisted of fifteen Lockheed 14s, by purchasing six of the Lockheed Company's latest transport model, the Lodestar 18. The value of the order is said to be $560,000. Delivery will be completed by December, and the new aeroplanes will be used on the route connecting Toronto, London, and Windsor.

On the above figure, the cost of the Lodestar is apparently £23,000. Its total loaded weight is 17,500 lb.

Strato-clipper to Trinidad

THE inauguration by Pan-American Airways of the new 9½-hours' substratosphere service by land aircraft between Trinidad and Miami will be of considerable benefit to the Island. It is part of the company's fast new service between the United States and South America by "strato-clipper," which cuts 1,000 miles off the journey by flying over the interior.

The new service will gain in importance when the United States naval and air base is established at Port of Spain, and for the people of Trinidad it already represents a significant advance because of the closer link it establishes with America as well as with Britain through the transatlantic flying services.

Petrol in Australia

THE first petrol produced from shale oil on a commercial scale in Australia was distilled at Glen Davis, New South Wales, recently and used to drive Sir Frederick Stewart, the Minister for Supply, by car back to Sydney, 150 miles away.

Petrol rationing began on October 1 throughout Australia. There was a big rush to buy reserves during the preceding week-end, New South Wales motorists alone buying 2½ million gallons at a cost of nearly £300,000.

American Airlines Buys More DC-4s

AN additional order for 15 DC-4s has been awarded to the Douglas Company by American Airlines. These 40-seater aircraft will be delivered between February and July, 1942. This follows the first order for 15, scheduled for delivery between March and December, 1941. The unit prices for the second order have not been divulged, but for the first order they varied from $348,023 to $368,671 (approximately £87,000 to £92,000), depending on engines and equipment.

Trans-Canada Increases

IN August the Trans-Canada Air Lines carried 7,061 passengers, an increase of 1,963 over the previous month and 3,881 over August, 1939. Mail amounted to 65,333 lb., an increase of 4,781 lb. over July and 21,339 lb. over August a year ago. Freight jumped from 8,779 lb. in July to 12,335 lb., an increase of 3,556 lb., and the increase over August, 1939, was 8,114 lb.

In the first eight months of the current year T.C.A. carried nearly three times as many passengers as in the same period of 1939. The total was 34,043, an increase of 22,308. Mail increased by 145,197 lb. to 276,398 lb. Express was more than doubled, the amount of increase being from 24,566 lb. to 62,928 lb.

DE-ICERS: The Boeing Flying Fortresses will not, unfortunately, have American Army Air Corps equipment when they arrive for the R.A.F.

Vice C.A.S.

AIR Chief Marshal Sir Wilfrid Freeman has been appointed Vice-Chief of the Air Staff in succession to Air Marshal Sir Richard Peirse, who recently took over the Bomber Command.

Sir Wilfrid was the Air Council Member for Development and Production for some four years, during which period he collaborated with Sir Charles Craven in planning and organising the aircraft side of the British war effort.

Air Chief Marshal Freeman transferred from the Army to the R.F.C. in 1914.

World's Greatest Hours?

E. HAMILTON LEE, United Air Lines captain, has been awarded the Men With Wings trophy for 1940 in recognition of his work as a transport pilot. His log book shows a total of 21,500 hours. He learnt to fly in 1913 and had accumulated 200 hours when the United States entered the war, during which Capt. Lee served as an instructor. In 1919 he became an air mail pilot between New York and Washington and has continued in air transport ever since. For the last three years he has been with United on the Los Angeles-San Francisco route, so completing 21 years of air-line flying.

Faster to Australia

THE time for transit of air mail from England to Australia will be reduced from 35 to 18 days, it has been announced by Major McCrindle, deputy director-general of British Overseas Airways, who is at present in Australia. The existing arrangements require that letters go by ship to Durban, the lower end of the "horseshoe route," and thence by air.

But this will be superseded by extending the Lisbon route down to West Africa, and from there across the continent to connect with the flying-boat service, perhaps at Khartoum.

U.S. Aircraft Exports

DURING the first year of the war the United States sent to Great Britain 743 aeroplanes, valued at $53,177,000. This announcement was made by Mr. Jesse James, administrator of the Federal Loan Agency. This is an average of 62 aircraft per month, one-fiftieth of the objective aimed at of 3,000 per month about which Lord Beaverbrook broadcast. Though this flow of aircraft is still only a trickle, we are extremely thankful for it and, in the hands of the R.A.F. pilots, much has been done with it. We are also confident that it will become a flood in the future. The average cost per aeroplane works out at £17,800.

Shot Down by Japanese?

IT is reported from China that a Douglas airliner of the C.N.A.C. line was shot down by Japanese fighters near the border of Kweichow and Yunnan. Of the American pilot and nine others aboard, several are believed to be killed or injured.

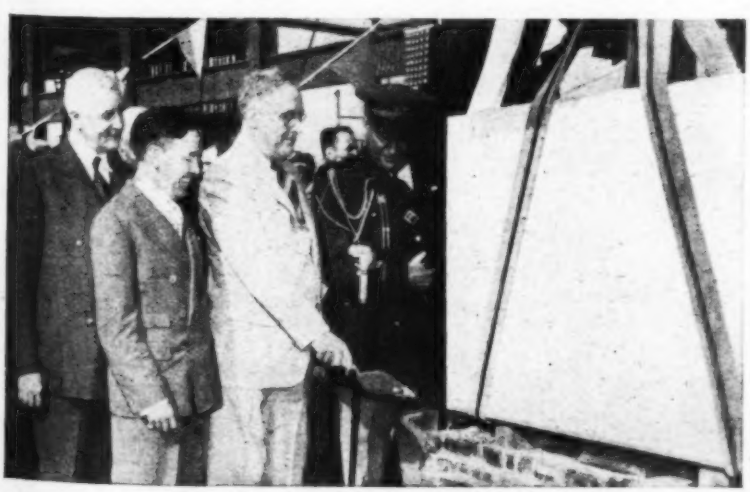
American Export to Buy T.A.C.A.

IT is reported that American Export Air Lines, which recently obtained a certificate of convenience and necessity for the operation of a transatlantic service in competition with Pan-American, will shortly buy the air freighting company, T.A.C.A., which has pioneered this work in the Central American States. Such a move would give this company a footing in an area which is very much a Pan-American one and it appears that there is likely to be some intense competition between these two companies, both backed by large amounts of capital, in the future.

That Australian Collision

UNLESS cameras lie, it is true. The two Ansons which collided in the air in Australia and, becoming locked together, were landed by the pilot of one, are now appearing in the news reels. We reported this story in *Flight* of October 24, page 343. The film shows the one Anson perched on top of the other and locked, apparently quite firmly, to it. The cockpit of the lower one is considerably smashed and it is remarkable that the crew of this one were able to bale out, which, very wisely, they did. The relative attitude of the two aircraft is such that their wings make a crude biplane, and it seems that they must have collided when travelling in the same direction at about the same speed, with the upper gliding or the lower climbing.

The original account said that the combination came to rest after a run of 200 yards, but as seen in the news reel the lower one had no undercarriage and either a belly landing was made or else the undercarriage collapsed during the run. In any case, the story is about the strangest ever, and the pilot (whose name sounded something like Phillips on the film) is a brave man.



President Roosevelt laying the cornerstone of the terminal building at Washington's new airport.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

VISIBLE VORTICES

Research Wanted

IT seems to me that a scientific investigation of these, *particularly with a view to discover a means of preventing them*, might well have important results. Apart from the fact that they reveal the position of the aircraft, there is a possibility that a study of them might help solve the problem of preventing planes being struck by lightning. A track of water-vapour (if it is water-vapour) leading from the plane might well form a path along which an electrical discharge could pass. When one reads the account by the gunner of the discharge of electrical sparks from his guns, one gets the impression that the passage of water-vapour in the slipstream is a potent factor.

In this connection we observed here recently a particularly vivid rainbow effect as the sun shone through one of these vortices. We wondered whether the extra vividness was due to a mixture of petrol fumes with water-vapour.

E. E. GOLDSMITH.

Black Trails

RE "visible vortices." On Tuesday last at approximately 5.45 p.m. a German aeroplane was flying over N.W. London in the direction of Aylesbury at a great height. The sky was fairly clear except for some ragged cloud formations at approximately the height of the plane. The sound of firing first attracted attention to the plane, which was travelling fast. The unusual thing, however, was the trail which the plane left behind it, for instead of being the usual white trail it was one of black, or rather a grey-hued black. The clouds were of a ragged alto-stratus formation.

The aircraft gave no indication of crashing in flames, which would have accounted for the trail, and it seemed at too great a height to have been exhaust smoke. Earlier in the day there had been low clouds and the weather was cold and sharp.

Perhaps if other readers saw the incident they could quote their views on the happening. C. G. MILLER.

IDENTIFICATION BY SOUND

Distinctive Characteristics of Some "Old Timers"

YOUR correspondent, Mr. C. T. Nance, is very right in his assertion that one can, with practice, distinguish between various aircraft types by the sound of the engines, though, of course, there is an obvious difficulty in cases like those of the Spitfire, Hurricane, Battle, Defiant and Fulmar—all using the V-12-cylindered Merlin.

Those of the Hart family equipped with the Kestrel could always be identified by the spluttering and popping they produced when the throttle was closed for an approach. When one watched them diving from an inaudible height, too, they seemed to cross an invisible line between soundlessness and cacaphony with startling suddenness. As with day and night in the East, there was no "twilight." The dive was silent and then instantly hurting to the ears.

On the other hand, very little noise issued from the Gauntlet fighter in a steep, engine-on dive. What there was was mostly produced by the bracing wires, the interplane struts and possibly by the airscrew. Perhaps this effect was due to the blanketing power of the inrush of air into the Townend ring.

One of the most easily distinguished, from sound alone, of all aircraft was the banner-towing Avro 504N. The Lynx engine of this modified 1913-type reminded me of nothing so much as the purring clack-clack of a grass-cutting machine! I am not, of course, casting any aspersions on this magnificent old veteran or its power-plant. I have seen it perform a "half-crown" turn with 90 deg. bank, banner and all!

Nevertheless, I wouldn't like to swear that I could always distinguish between a Gipsy Major and a Cirrus or even between a Merlin and that dreadful piece of machinery installed in the cowling of the North American Harvard trainer.

S. HOWARD BARNETT.

["That dreadful piece of machinery" is actually a very good engine, but there is no denying that the Harvard is noisy.—Ed.]

The Effect of Direct Injection

MR. WEBSTER raises a very interesting point by suggesting that the prevalence of phase heat in the sound of enemy aircraft is due to the direct-injection system. Though it is extremely doubtful if variations in pump delivery could of itself cause the "temporary cessation of noise," as he puts it, it is very possible that such variations make the exact synchronisation of engines difficult.

It will be interesting to see if this difficulty is overcome by advances in pump design in future German machines, and if the "Boche beat" will therefore disappear and be put down as one of the hullucinations of a less enlightened age.

C. T. NANCE, B.A.

LONG-RANGE BOMBERS

Captain Macmillan's Specification

IN his interesting article in last week's issue of *Flight* Captain Macmillan asked our designers for a long-range bomber capable of carrying a bomb load of five tons over a distance of 5,000 miles at a speed of 400 m.p.h. From the Editorial remark asking for offers from designers it would appear that the Editor does not consider such a machine possible. Yet it is an old saying that the record-breaking aeroplane of to-day is the service type of to-morrow.

Are not our present-day fighters as fast as the out-and-out racers of but a few years ago? The world's long-distance record of 7,158 miles stands to the credit of the Vickers Wellesleys. Surely by now it ought to be possible, using every known means of increasing range, including assisted take-off, to equal that performance. "INTRIGUED."

Wimbledon.

[Our correspondent appears to overlook the fact that the Wellesleys carried no load other than petrol. Five tons of bombs presupposes quite a large aeroplane. However, Mr. Pemberton Billing has promised to tell us in next week's issue how it can be done.—ED.]

U.K. as ADVANCED STRIKING BASE (Continued from page 393)

The evacuation of Dunkirk was a far more perilous act, and it is nonsense to say that our redundant civil population cannot be evacuated. The evacuation of children overseas had to be called off because it was not made a first-class military operation. But pave the way. Attack submarine bases by aircraft and naval craft, bomb air bases of the enemy. Clear the sea of most of the under- and over-water pests as part of the operation of evacuation. Don't just ship women and children haphazardly, hoping the ships will get across. Make sure they get across. What, in truth, is our Navy and Air Force for?

And is it too much to ask the Americans to take a leaf out of the book of the new rules (*sic*) of the Nazi-Fascist methods of waging war and take their stand to help in a policy of non-belligerent, wholehearted, co-operation with the Allies?

If we are to win this war, and if America is not to lose it, nothing must be allowed to stand in the way of maintaining the British Isles secure as an air base, an unconquerable air base, an air base into which the munitions of the West can flow in ever-increasing numbers, and from which the air war can be carried with ever-increasing force into the heart of Germany and the heart of Italy until the war machine which they have erected and which they worship as a modern Baal is pulverised to powder in the main bases of the enemy.

That is the basis of future air strategy for Britain. The first step is to evacuate completely all non-possible-combatants. America, what about it?

"Flight" photograph.

HUDSON NAVIGATION: A Coastal Command navigator uses the hand bearing compass through the starboard window.

O.M. for Sir Cyril Newall

ON Tuesday of last week Marshal of the Royal Air Force Sir Cyril Newall was invested by His Majesty the King with the Order of Merit. Sir Cyril thus becomes the first Royal Air Force officer to receive this honour. Until the end of 1935, when the statutes of the Order were altered, Air Force officers were precluded from receiving it.

Sir Cyril Newall is the fourth military member of the Order, the others being Field Marshal Sir Philip Chetwode, Lieutenant-General Lord Baden Powell, and Admiral of the Fleet Lord Chatfield.

Christian Science Representatives

MR. ADDINGTON C. CRONK and Mr. Stanley C. Morgan have been nominated by the Church of Christ, Scientist, to minister to the needs of Christian Scientists serving in the Royal Air Force, and approval has been given for these representatives to visit R.A.F. stations (other than secret stations) for this purpose.

The address of the headquarters, in this country, of the Christian Science Church is Donington House, Norfolk Street, Strand, W.C.2.

Dominion Membership R.A.F. Club

MEMBERSHIP of the Royal Air Force Club is now open to officers of the Dominion Air Forces at half subscription rates. The rates for Dominion membership are: London area (30 miles radius), £5 5s. per annum; country area, £3 13s. 6d. per annum.

Forms of application can be obtained from the Secretary, Royal Air Force Club, 128, Piccadilly, London, W.1, or from the respective High Commissioners, through whom all applications for membership should be made.

O.U.A.S. Re-formed

THE Oxford University Air Squadron, which was discontinued at the outbreak of war, has been re-formed under the command of Wing Commander H. R. A. Edwards, who is a Christ Church man and an old rowing Blue.

Pilots and air crews are being enrolled and members of the O.T.C. may transfer into the air squadron with the approval of their commanding officer.

R.N.V.R. Air Branch Recruits

WELL-EDUCATED men are required for commissions in the Air Branch of the Royal Naval Volunteer Reserve as pilots and observers. The age limits are 18 to 28, and men who have registered but have not yet been called to the colours may apply for a transfer. Successful applicants will enter the R.N.V.R. as naval ratings and receive their commissions at the conclusion of satisfactory training.

Applications should be made at the nearest combined recruiting centre or, in writing, to the Secretary of the Admiralty, S.W.1.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm— *—News and Announcements*

Awards

THE King has been graciously pleased to approve the following awards, in recognition of gallantry displayed in flying operations against the enemy:—

COMPANION OF THE DISTINGUISHED SERVICE ORDER.

SQN. LDR. R. G. KELLETT, D.F.C., A.A.F.—Squadron Leader Kellett as commander of his squadron has built up and trained his personnel to such a fine fighting pitch that no fewer than 113 enemy aircraft have been destroyed in the space of one month, with very few casualties sustained by his squadron. He has frequently led the wing formation with judgment and success. The gallantry and fine leadership displayed by Squadron Leader Kellett have proved an inspiring example.

BAR TO THE DISTINGUISHED FLYING CROSS.

FLT. LT. R. F. BOYD, D.F.C., A.A.F.—This officer has personally destroyed at least 12 enemy aircraft, and has assisted in the destruction of one other. His fine leadership has enabled his squadron to attain many successes with few losses to themselves. Flight Lieutenant Boyd has distinguished himself by his cool bearing and capable leadership.

F/O. B. J. G. CARBURY, D.F.C.—Flying Officer Carbury has displayed outstanding gallantry and skill in engagements against the enemy. Previous to September 8, 1940, this officer shot down 8 enemy aircraft, and shared in the destruction of two others. Since that date he has destroyed two Messerschmitt 109s and 2 Heinkel 113s, and, in company with other pilots of his squadron, also assisted in the destruction of yet another two enemy aircraft. His cool courage in the face of the enemy has been a splendid example to other pilots of his squadron.

FLT. LT. R. R. S. TUCK, D.F.C.—Since June 11, 1940, this officer has destroyed six enemy aircraft, and probably destroyed or damaged six more. In August, 1940, he attacked three Junkers 88s, destroying two and damaging the third. He also intercepted two Junkers 88s, and in a head-on attack destroyed one. In a similar attack on the second, a cannon shell disabled his aircraft, but he reached the coast and landed by parachute. In September, 1940, he shot down one Messerschmitt 110 and probably a Messerschmitt 109, and one week later destroyed a Messerschmitt 109 in the sea. Flight Lieutenant Stanford Tuck has displayed gallant and determined leadership.

DISTINGUISHED FLYING CROSS.

GROUP CAPT. S. F. VINCENT, A.F.C.—Group Capt. Vincent has been observing his wing from the air and up to the end of September, 1940, has made some dozen sorties alone. In September, 1940, he met 15 Dornier 215s and turned them back, damaging one. Later in September, 1940, he destroyed one of a large enemy formation, and created so much confusion that another Messerschmitt 109 was shot down by German pilots. He is a born leader and has brought the efficiency of his station to a very high level.

SQN. LDR. H. A. V. HOGAN.—This officer has led his squadron with distinction. Sixty-nine hostile aircraft have been destroyed and many others damaged. Three of this number were destroyed by Squadron Leader Hogan personally.

P/O. R. BERRY.—P/O. Berry has personally destroyed six enemy aircraft, and assisted in the destruction of several others. Through innumerable engagements with the enemy he has shown the greatest gallantry and determination in pressing home his attacks at close range. The skill and dash with which this officer has led his section have done much to assure its successes.

P/O. C. T. DAVIS.—P/O. Davis has destroyed six enemy aircraft. He has displayed great dash and courage in his many combats, and his gallantry in fighting against any odds has been conspicuous.

P/O. W. H. HODGSON.—In August, 1940, P/O. Hodgson took part with his squadron in an engagement against more than 250 enemy aircraft, severely damaging several of them. Two days later he operated with his squadron against 150 bombers and fighters, and on this occasion destroyed two Messerschmitt 110's, and damaged a Heinkel III. Later in August, 1940, during an engagement against 30 Dornier 215's, escorted by about 100 enemy fighters, he attacked one of the Dornier 215's head-on, severely damaging it, and then engaged and shot down a Messerschmitt 109. Although P/O. Hodgson's aircraft was hit and set on fire by a cannon shell he managed to keep the fire under control until he had effected a landing some distance away. By so doing he undoubtedly avoided causing civilian casualties. This officer has exhibited bravery of a high order, and a complete disregard of his own personal safety.

P/O. K. W. MCKENZIE.—Early in October, 1940, whilst on patrol, this officer sighted a formation of eight Messerschmitt 109's. He attacked and damaged one of them which dived to sea level. Having expended all his ammunition, P/O. McKenzie flew alongside the hostile aircraft and endeavoured unsuccessfully to force the enemy into the sea. Undeterred he severed the tail-plane of the Messerschmitt with his wing tip. Subsequently he was attacked by a number of Messerschmitt 109s, and although his aircraft was severely damaged he succeeded in reaching land and made a crash landing. In one week, P/O. McKenzie has destroyed five enemy aircraft. His skill and gallantry have been of the highest order.

P/O. D. H. MCARTHUR.—P/O. McArthur was the pilot and captain, and Sgt. Mylod the front gunner of an aircraft detailed to carry out an attack on a target in the Ruhr one night in October, 1940. On the return flight, and while still over enemy territory, P/O. McArthur noticed an aircraft some distance ahead below him, caught in the beams of several searchlights. This aircraft then gave recognition signals, and the searchlights were extinguished. P/O. McArthur decided to attack and the aircraft was put into a steep dive. By his excellent shooting and judgment Sgt. Mylod shot down the enemy aircraft in flames with only four short bursts of fire. The fire caused by the wrecked aircraft was seen thirty miles away on the homeward flight. P/O. McArthur has now completed thirty-five major bombing operations during which he has shown a grim determination to carry out his instructions. Sgt. Mylod has taken part in seven major bombing missions and has shown great determination, initiative and keenness.

FLT. LT. J. A. KENT, A.F.C.—Early in October, 1940, this officer, when entirely alone, attacked 40 Messerschmitt 109s and shot down two of them. He has personally destroyed at least four enemy aircraft. Flt. Lt. Kent has been responsible in a large measure for the fighting efficiency of his squadron and has materially contributed to its successes. He has proved himself a born leader.

FLT. LT. G. R. MCGREGOR, R.C.A.F.—This officer has destroyed at least three enemy aircraft, and has damaged many others. He has led his flights and frequently the squadron with gallantry and dash.

ACT. FLT. LT. J. M. BAZIN, A.A.F.—This officer has shot down some ten enemy aircraft. He himself was shot down on one occasion, over enemy territory, but with amazing initiative and determination rejoined his unit within 24 hours. In August, 1940, he destroyed two enemy aircraft in raids on the North-East coast, and in September, 1940, he led two squadrons in a head-on attack against 100 to 120 enemy aircraft. The enemy were completely nonplussed and fled. As a leader Flt. Lt. Bazin has shown marked ability and initiative.

ACT. FLT. LT. F. J. HOWELL.—This officer has shot down four enemy aircraft, has been partly responsible for the destruction of five more, and has damaged several others. He has led both the squadron and his flight with skill and determination, which have undoubtedly contributed greatly to recent successes. Flt. Lt. Howell's keenness

"Flight" photograph.

Wing Commander H. R. A. Edwards, who is now Officer Commanding the reconstituted Oxford University Air Squadron.

FOR THE HIGH SEAS: Two views of one of our new aircraft carriers which has been commissioned for the first time. The overall length is 753 ft. and the displacement 23,300 tons. Sixteen 4.5 inch dual purpose guns are mounted in pairs at flying-deck level, in addition to various small pieces of ordnance such as multiple pom-poms and 3-pounders. A complement of 1,600 men is carried.

and energy, combined with his courage and leadership in many combats, have set a splendid example to the rest of the squadron.

ACT. FLT. LT. C. B. F. KINGCOME.—Flt. Lt. Kingcome has personally destroyed six enemy aircraft, and by his leadership has been responsible for the destruction of many others. He has led his flight, and lately his squadron, with judgment, skill and keenness.

F/O. J. R. COCK.—This officer has destroyed seven enemy aircraft. In August, 1940, when in action against a large formation of enemy aircraft, he attacked and destroyed a Junkers 88. During this combat he was attacked from below and his aircraft caught fire. Though wounded, he escaped by parachute and fell into the sea, but saved himself by swimming ashore. F/O. Cock has shown magnificent courage and initiative against overwhelming odds.

F/O. B. VAN MENTZ.—F/O Van Mentz has been engaged in operations against the enemy since the outbreak of war. He has destroyed six enemy aircraft and probably a further three, two of which were shot down during the period of intensive operations in France. This officer has led his section, and at times his flight, with skill and courage, and has shown great determination in pressing home his attacks against large enemy formations.

F/O B. D. RUSSELL, R.C.A.F.—F/O. Russell has personally destroyed five enemy aircraft and has assisted in the destruction of a sixth. He has shown great keenness to attack the enemy.

P/O. A. C. BARTLEY.—P/O. Bartley has shot down at least eight enemy aircraft. He has always displayed great coolness in action and proved himself a clever and determined fighter.

P/O. D. M. CROOK, A.A.F.—This officer has led his section with coolness and judgment against the enemy on many occasions. He has destroyed six of their aircraft besides damaging several more.

P/O. J. CURCHIN.—This officer has displayed great keenness and skill in combat against the enemy. On a recent occasion he pursued an enemy aircraft thirty miles out to sea and finally destroyed it. He has destroyed at least seven hostile aircraft and shared in the destruction of others.

DISTINGUISHED FLYING MEDAL.

SGT. P. A. BURNELL-PHILLIPS.—In August, 1940, this airman displayed great skill when, by determined flying tactics, he forced a Dornier to crash into the sea although he had expended all his ammunition. On another occasion he destroyed a hostile aircraft after his own had been severely damaged and he had received a bullet wound in his feet. He has displayed exceptional skill, determination and gallantry in his attacks against the enemy and has destroyed at least five of their aircraft.

SGT. J. J. J. MYLOD. (See P/O. D. H. McArthur.)

SGT. C. F. BABBAGE.—Sgt. Babbage has shown consistent keenness and ability in operations against the enemy, he has personally destroyed six enemy aircraft and probably one other.

SGT. H. N. HOWES.—During the period of intensive operations in France, Sgt. Howes destroyed four enemy aircraft. In August, 1940, he took part in attacks against large enemy formations. He personally destroyed two Messerschmitt 110s and one Dornier 215, and severely damaged several others. Sgt. Howes has proved himself a brave and determined pilot.

SGT. T. Y. WALLACE.—In a period of three weeks, Sgt. Wallace has destroyed seven enemy aircraft, and probably another four. On one occasion he became separated from his squadron and, single-handed, pursued a formation of enemy bombers back to the French coast. While in mid-Channel he was attacked by six enemy fighters, and although his aircraft was severely damaged in the resulting battle, he shot down one enemy aircraft and damaged another. Sgt. Wallace has displayed conspicuous courage and fighting ability.

Middle East Command

DISTINGUISHED FLYING CROSS.

Act. Wing Cdr. D. S. Radford, Sqn. Ldr. A. McD. Bowman, Act. Flt. Lt. J. F. Roulston, P/O. J. S. Higgins.

DISTINGUISHED FLYING MEDAL.

Sgt. J. S. Turner, Act. Sgt. W. McRobbie.

The above awards are for gallantry and devotion to duty in the execution of air operations.

On a 1,000 miles return flight, over mountainous country and in extremely poor weather conditions, one of the officers decorated, in this list showed exceptional navigational skill in finding and successfully surprising an enemy aerodrome. Direct hits were scored on the hangars and valuable photographs taken, in spite of heavy anti-aircraft fire and fighter opposition.

A second officer has led several raids against enemy aerodromes and military objectives with skill and determination. On one occasion he bombed enemy aircraft on the ground from a very low altitude, set fire to two and probably damaged several more. On another raid he scored two direct hits on the petrol installation of an aerodrome.

Another officer has led eleven most successful raids on enemy territory. Once he beat off an attack on a bomber of his formation, thus enabling it to reach British territory. He also successfully organised and carried out, in conjunction with fighter aircraft, an attack which destroyed three enemy petrol dumps and an ammunition dump. The influence of his untiring efforts and example is reflected in the many successes of the Squadron.

Of the two sergeants, one has been the leading observer on all his Squadron's raids since the beginning of hostilities with Italy. He was individually responsible for locating and photographing an enemy landing ground, thus enabling an early raid to be organised and much damage done to enemy aircraft and equipment.

The other sergeant was under training as an air gunner on the outbreak of hostilities with Italy and had had very little experience of handling a gun in the air. In June, 1940, when returning from a raid, his aircraft was attacked at close quarters by an enemy fighter and came under heavy fire from its multiple guns. The airman nevertheless maintained a steady fire from his single Lewis gun and brought the fighter down. He has taken part in the majority of his Squadron's raids over enemy territory.

Waziristan Awards

THE King has been graciously pleased to approve the undermentioned appointments and awards in recognition of gallant and distinguished service during operations in Waziristan in 1939:—

MILITARY DIVISION OF THE MOST EXCELLENT ORDER OF THE BRITISH EMPIRE.

Act. Sqn. Ldr. D. G. H. Spencer; Flt. Lt. L. H. Starr.

MEDAL OF THE MILITARY DIVISION OF THE MOST EXCELLENT ORDER OF THE BRITISH EMPIRE, FOR MERITORIOUS SERVICE.

Sgt. B. Lock; Cpl. E. W. Banks; Cpl. F. J. Greenfield.

DISTINGUISHED FLYING CROSS.

Wing Cdr. E. L. S. Ward; Act. Flt. Lt. A. W. T. Traill; Flt. Lt. D. H. Burnside; F/O. H. G. F. Gaubert.

DISTINGUISHED FLYING MEDAL.

Flt. Sgt. B. J. Thomas; Sgt. F. W. Amey; Sgt. P. Anscombe; Sgt. R. Hughes.

MENTIONS IN DESPATCHES.

Air Comdre. A. W. F. Glenny, M.C., D.F.C. (now retired); Act. Wing Cdr. W. V. L. Spendlove; Sqn. Ldr. A. G. G. Baird; Sqn. Ldr. J. Darwen; Flt. Lt. G. H. N. Gibson; Flt. Lt. C. H. Jones, D.F.C.; Flt. Lt. W. R. Selkirk; Flt. Lt. (Act. Sqn. Ldr.) P. Stevens; Act. Flt. Lt. K. W. Bonnar; F/O. J. G. Fraser; F/O. L. F. M. Saunders; F/O. B. J. Thomas; P/O. R. D. Williams; W/O. W. G. Canning; W/O. F. Bidgood; W/O. A. G. Haggar; W/O. A. J. G. Peirce; Flt. Sgt. W. J. Shirlaw; Sgt. P. N. Kingwill; Sgt. A. E. Usher; Sgt. H. W. Cooper; Cpl. S. Fisher; Cpl. A. Collie; Cpl. E. J. Street; L.A/C. W. V. Jones; Sgt. R. Smith; A/C.1 S. H. Wakeling.

Long Service Medals

The Long Service and Good Conduct Medal has been awarded to the undermentioned airmen:—

Warrant Officers: A. W. Attrill; J. W. Burnett; H. W. Cambell; J. Clifton (temp.); R. Eve; A. N. Jarvis; A. E. Langman; K. F. Mee (temp.);

SERVICE AVIATION (CONTINUED)

G. T. Miller (temp.); E. J. Perkins (temp.); W. H. Potten (temp.); G. E. Reep (temp.); J. T. Stevens (act.); G. D. Thom (temp.); R. W. Toole; R. A. Turrell, M.C. (temp.); W. H. Warren; A. Watson; D. T. Way; J. Williams.

Flight Sergeants: W. J. Allardyce; C. W. R. Baker; L. J. G. Bayliss; A. H. N. Beaumont (temp.); G. J. Bishop; A. G. Black (temp.); E. T. Blake (act.); S. Boardman; W. Bowden (temp.); A. Bradford; S. G. Brown (temp.); F. G. Buddin; P. C. J. E. Carragher; A. F. Cockerell (temp.); M. Curthoys; J. Dean; E. D. Downes (temp.); G. E. Elliott; C. D. Faull; C. A. Fisher; W. R. Freeman; E. F. Giddings (temp.); J. N. Goulty; S. G. Grainger (temp.); J. A. Gregory (temp.); J. E. Grime (act.); E. A. Hallett; G. E. F. Hayes; R. Hughes; R. C. V. Jackson; R. W. Jarred, A.F.M.; W. C. A. Jenner; W. H. Keast (temp.); H. Kelsey (temp.); H. G. Kemp; G. Lardner; L. G. Leech; A. W. Lindley; J. T. L. Lowe; A. E. Lucas; S. J. Meagor; J. Moir (act.); W. R. Morris; A. J. Nash; R. N. Nesbitt; T. A. Newton, A.F.M.; C. W. Oakes; R. H. Owens; H. Pardoe; G. A. Pearson; G. E. Pratt; A. L. Pritchard; R. F. Quartermaine; H. G. Reade, E. F. Ridley, T. K. R. Robson; A. J. Rowthorn (temp.); J. Rudd; W. A. Sambrook (temp.); W. A. Samphier (act.); M. Sayer (temp.); D. Shaw; D. G. Sinclair (temp.); G. A. Smith; W. R. Squirrell (temp.); D. E. Sutherland; L. Taylor; V. A. Tidey; E. A. Tyler; A. J. Veal; G. E. Veasey (act.); A. B. E. Williams; J. L. Williams (temp.); W. R. Williams.

Sergeants: G. S. Axford; F. P. Bridger; C. Bratt; C. A. Cookson; J. Coupe; J. W. S. Croft; G. J. Darlington; C. F. W. Duffort; W. H. F. Facey; F. G. Flemington; C. H. Gearing; J. Henderson; W. G. Hillman; G. S. Hood; J. Ivimey; G. E. Jeffries; H. C. Langston; S. C. Letley; C. H. Loder; H. W. McAlhone; J. McFarlane; L. T. Monk; G. Nash; V. Northam (temp.); H. F. J. Nottingham (temp.); A. Pearson; R. Penter (temp.); L. Philipson (temp.); C. C. Prestidge; W. Price; A. Robinson; W. G. Smith; S. H. E. Taylor; H. H. Tennent; E. S. Thompson; A. S. Thomson; S. G. Trusty; W. A. Vincent (temp.); G. E. Williams; F. N. Worzencraft.

Corporals: C. E. Bigge; R. Cowie; W. Frazier (temp.); W. C. S. Hinds; J. J. Pettet; C. D. Troman.

Leading Aircraftman: R. W. Adams.

Aircraftman, 1st Class: R. G. Tucker.

Roll of Honour

Air Ministry Casualty Communique No. 50.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed.

KILLED IN ACTION (WHILE FLYING IN OPERATIONS AGAINST THE ENEMY).—Sgt. A. Algar, 970031; Sgt. H. H. Allgood, 565462; P/O. R. V. Baron, 78741; F/O. N. J. M. Barry, 72514; P/O. J. W. Broadhurst, 41898; Sgt. G. W. Brown, 566550; Sgt. W. A. Cannon, 746801; P/O. H. R. Case, 83272; A/C.2 C. F. Cooper, 1003497; P/O. G. H. Corbett, 81366; Sgt. C. Cottham, 637463; Sqn. Ldr. J. W. Dallamore, 36074; F/O. I. B. Dilford, 39865; P/O. H. D. Edwards, 41837; P/O. C. E. English, 77791; Sgt. J. R. Farrow, 745091; Sgt. A. N. Feary, 742301; P/O. H. I. Goodall, 79159; Sgt. C. Goodwin, 754024; P/O. R. A. Hadley, 79511; Sgt. A. R. S. Hall, 755403; Sgt. G. E. Hall, 960575; P/O. R. W. Harris, 42988; Sgt. M. R. Harvey, 936278; P/O. H. P. Hill, 41847; P/O. C. A. Hobson, 42566; P/O. M. G. Homer, D.F.C., 33409; F/O. R. Hope, 90257; P/O. J. G. Lecky, 33570; A/C.2 J. P. McCaul, 1050678; Sgt. W. G. MacMorland, 751459; P/O. H. K. F. Matthews, 40551; Sgt. J. E. Merrett, 520314; Act. Flt. Lt. I. J. Muirhead, D.F.C., 43362; Sgt. J. P. O'Connor, 627424; P/O. D. H. O'Neill, 40638; P/O. A. J. S. Pattinson, 40563; P/O. R. A. Phillips, 79756; Sgt. K. Postgate, 565653; Sgt. J. M. Ramsay, 533261; Sgt. W. B. Rayment, 751840; P/O. A. G. Sheppard, 78447; Sgt. G. E. Shepperd, 523887; Sgt. C. A. Sherwood, 536431; P/O. N. Sutton, 84033; Sgt. J. V. Wadham, 742598; Sgt. R. A. Ward, 740913; Sgt. J. R. Wardman, 939888; Sgt. B. E. P. Whall, D.F.M., 740484; P/O. D. G. Williams, 41890; Sgt. C. A. Wright, 740280; P/O. G. Wright, 40162.

PREVIOUSLY REPORTED "MISSING, BELIEVED KILLED IN ACTION." NOW PRESUMED "KILLED IN ACTION."—Sgt. W. J. Garfield, 740997; Sgt. A. Kay, 647610; Sgt. B. W. Mesner, 745987; A/C.1 J. B. W. Warren, 628804.

PREVIOUSLY REPORTED "MISSING." NOW PRESUMED "KILLED IN ACTION."—P/O. H. C. F. Fenton, 42493; F/O. P. H. Lewis, 70399; Sgt. H. W. Richardson, 581413.

PREVIOUSLY REPORTED "MISSING." NOW REPORTED "KILLED IN ACTION."—Act. Wing Cdr. J. S. Dewar, D.S.O., D.F.C., 26029; F/O. J. R. Hardacre, 41405; Act. Flt. Lt. D. G. Parnall, 70522; F/O. O. St. J. Pigg, 39678; Sgt. M. H. Sprague, 741141; F/O. L. H. Schwind, 37870.

WOUNDED OR INJURED IN ACTION.—Sgt. A. G. Byron, 580569; Sgt. E. V. Darling, 740608; Sgt. R. D. Dunscombe, 741772; Sgt. V. H. Ekins, 745414; P/O. K. A. Faulkner, 82696; Sgt. G. B. Fielder, 755751; P/O. K. C. Gundry, 81371; Sgt. G. T. Hardwick, 581334; Act. Flt. Lt. C. B. F. Kingcome, 33319; F/O. H. J. Lyon, 37975; Flt. Lt. A. M. MacLachlan, 90085; Sgt. J. W. McLaughlin, 758184; Sgt. E. T. Osborne, 580803; P/O. J. H. Pickering, 80821; Sgt. D. J. N. Ward, 742056; Sgt. P. H. Willcocks, 742044; Flt. Lt. A. R. Wright, 33499.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. K. C. Pattison, 742457; Sgt. S. Walters, 626198.

PREVIOUSLY REPORTED "WOUNDED OR INJURED IN ACTION." NOW REPORTED "DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION."—Sgt. H. H. Wilson, 630349.

"MISSING," BELIEVED "KILLED IN ACTION."—Sgt. E. A. Bayley, 741004; Sgt. L. Dudley, 741157; P/O. A. F. Etherington, 78460; Sgt. P. H. Fletcher, 566110; Sgt. D. V. Hayter, 745222; Sgt. J. Jobson, 525052; P/O. R. A. MacFarlane, 33546; Sgt. J. C. Murray, 552235; Sgt. W. H. Powell, 902976; P/O. H. Parkinson, 42954; P/O. W. S. Shann, 43711.

MISSING.—P/O. N. H. Andrew, 36252; P/O. C. C. Bennett, 42097; Sgt. H. Bennett, 549557; P/O. S. R. Bevan-John, 81933; P/O. A. S. Boak, 43020; P/O. G. K. Brackenridge, 70074; Sgt. G. B. Brash, 639109; Sgt. F. J. Brooker, 742131; Sgt. D. Bruce, 536872; Sqn. Ldr. G. J. Bush, 37061; Sgt. A. D. Cameron, 746944; Sgt. L. Cater, 741384; Sgt. A. J. Cheesman, 751223; Sgt. A. E. Chetter, 966961; Sgt. G. S. Clarke, 747818; P/O. J. S. Cleaver, 78454; Sgt. J. Corney, D.F.M., 541684; P/O. P. S. Daly, 42592; Sgt. G. J. Devlin, 755390; Sgt. C. Dowsett, 650716; F/O. W. G. Espley, 40292; P/O. R. W. Ferguson, 43064; Sgt. D. B. Fleming, 743005; Act. Flt. Lt. C. D. Fox, 37797; Act. Flt. Lt. K. McL. Gillies, 37799; Sgt. L. G. Goldie, 745606; Sgt. R. W. Grace, 751623; Sgt. J. R. Hall, 740620; Sgt. E. Harrold, 805497; Sgt. E. G. A. Hart, 551127; Sgt. G. L. Ismay, 745438; Sgt. G. E. Keet, 751079; Sqn. Ldr. G. B. Keily, D.F.C., A.F.C., 27256; P/O. J. C. Kirkpatrick, 81630; Sgt. R. Little, 754893; P/O. J. Littlejohn, 79207; P/O. J. McIntosh, 43289; Sgt. M. MacKenzie, 531722; P/O. D. MacLean, 79167; Sgt. J. G. C. MacNair, 7555C2; Sgt. S. MacQuire, 747938; Sgt. J. D. Marshall, 817236; Sgt. G. E. Matson, 581164; Sgt. K. H. Meadowcroft, 581019; Sgt. P. A. Merrick, 755031; P/O. H. W. Morgan, 43708; Sgt. R. J. Neale, 745300; Sgt. A. C. Peck, 755616; Sgt. A. J. Pennington, 581410; Sgt. H. W. Pritchard, 751821, P/O. J. Rea, 42647; Sgt. P. H. Richmond, 639639; Sgt. L. A. E. Riddington, 74251C; Sgt. J. D. Robertson, 644958; Sgt. A. Roscoe, 633114; Sgt. A. Russell, 533654; Sgt. H. A. Shaw, 630002; Sgt. B. J. Shelton, 642942; Sgt. F. A. Sibley, 758073; Sgt. E. R. Sillett, 640098; Sgt. V. Snell, 745231; Sgt. W. J. Stephen, D.F.M., 534391; Sgt. R. P. Sweett, 903248; Sqn. Ldr. J. C. Taylor, 34115; P/O. R. C. Thomas, 82731; Sgt. K. S. Thompson, 937784; Sgt. N. W. G. Thompson, 745185; Sgt. R. E. Thompson, 745851; P/O. C. F. Tibbitts, 43050; Sgt. J. C. Usher, 580912; Sgt. J. Le B. R. Walter, 902245; Sgt. S. Warren, 754879; Sgt. K. H. Watchous, 516040; Sgt. C. Wessels, 742634; Sgt. D. E. Westwood, 805525; Sgt. A. White, 540565; Sgt. T. F. Williams, 902179; Sgt. C. H. Wise, 505501; Sgt. G. Wood, 580689; Sgt. P. H. Yorath, 532375; Sgt. P. A. Young, 650628; Sgt. I. A. Zamek, 749523.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. H. Ahsley, 561992; P/O. M. J. Berry, 40877; Sgt. J. J. Bogue, 751147; Sgt. R. T. Bowtell, 805458; Sgt. W. J. Brett, 971032; F/O. J. F. Bridge, 77783; F/O. W. S. Brown, 40505; Sgt. V. N. Buchan, 741153; Sgt. E. Burt, 971328; Sgt. S. Chambers 759176; Sgt. H. R. Clayton, 939677; Sgt. C. O. Cook, 748780; Act. Flt. Lt. S. F. Coutts-Wood, D.F.C., 37794; L.A/C. J. P. Fleming, 746992; Sgt. J. Fletcher, 548378; Sgt. N. R. Foley, 758162; Sgt. J. G. Gow, 742021; Sgt. B. Harvey, 936441; Sgt. H. Haslam, 969957; P/O. D. Hastings, 42406; Sgt. I. de S. E. Hay, 906233; F/O. C. C. Hicks, 44141; A/C.2 F. G. Holmes, 942950; Sgt. F. J. Howarth, 745182; Wing-Cdr. J. H. Hutchinson, 16112; Act. Sgt. C. T. Jacobs, 777633; Sgt. R. A. W. Keeling, 638360; Cpl. N. L. D. Kemp, 354299; Sgt. L. Kendray, 754420; L.A/C. J. H. Kissner 932026; A/C.1 C. W. Lawry, 886111; Sgt. G. N. Lindsey, 748417; Sgt. G. Loud, 748537; Sgt. P. H. Lucas, 551706; L.A/C. A. Mackley, 622487; Sgt. P. P. McKee, 911283; Wing Cdr. S. McKeever, D.F.C., 07229; Sgt. E. S. Millard, 632538; P/O. D. J. Neill, 81336; L.A/C. D. H. Oldham, 1152047; Sgt. M. Parker, 745523; Sgt. C. E. Petitt, 754782; Sgt. F. D. Phœnix, 971265; A/C.1 W. Pinder, 963017; Sgt. K. S. Powers, 742000; Sgt. G. O. Powis, 627228; Sgt. D. S. Proudfoot, 745400; Act. Flt. Lt. J. E. Rienenhausen, 39127; Sgt. J. C. Scott, 745031; A/C.2 A. Sharp, 1014256; Sgt. J. P. Sheils, 741808; Sgt. E. H. W. Shelfer, 742909; Sgt. W. P. Small, 754430; Sgt. F. Smith, 970132; Sgt. E. D. Stapleton 741973; Cpl. A. B. Stone, 844066; Sgt. D. Valentine, 745028; Sgt. C. E. E. Virgo, 741614; Sgt. W. H. Wake, 742271; Sgt. C. W. Walker, 741405; L.A/C. A. E. Ward, 842231; L.A/C. F. B. Wilde, 545243; Sgt. D. W. Wordsworth, 754549; Act. Flt. Lt. R. M. G. Zambra, 25127.

PREVIOUSLY REPORTED "MISSING" BELIEVED "KILLED ON ACTIVE SERVICE." NOW REPORTED "KILLED ON ACTIVE SERVICE."—Sgt. A. Bell, 745256.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 K. Boyns, 1166761; A/C.2 W. L. Brookes, 941075; Cpl. T. Collier, 857332; Act. W/O. G. A. Davies, 590037; Act. Flt. Lt. F. J. Ford, 31433; Sgt. H. W. Green, 939533; Sgt. A. A. Griffin, 514979; A/C.2 F. Harris, 761403; A/C.2 H. D. Hodgins, 912329; P/O. B. L. H. Howes, 78981; P/O. R. Innell 61570; P/O. S. J. Jacobi, 82698; A/C.2 G. B. Jones, 955873; Sgt. J. F. R. Jones, 741259; A/C.1 W. Kelly, 936003; A/C.2 J. Kendall, 1300309; Sgt. J. O. N. Lawrence, 742655; A/C.2 S. J. Lockwood, 1162285; A/C.2 G. C. F. Lusty, 1185373; L.A/C. M. J. Newcomb, 842037; L.A/C. E. G. Plank, 1181296; Sgt. N. T. Powell, 629099; Sgt. J. Roberts, 700170; A/C.1 L. P. E. Rowland, 542784; Sgt. W. Shankland, 902858; A/C.2 H. Simpson, 950652; P/O. E. J. Spencer, 43931; A/C.1 J. Thomas, 639724; A/C.1 R. J. Watson, 750890; Sgt. F. Webster, 755816; Sgt. A. W. White, 903902.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. R. W. Ammon, 903870; L.A/C. H. Farrell, 543833; L.A/C. H. Hall, 551395; A/C.2 W. H. Moon, 1012215; A/C.1 R. E. N. Phelps, 636606; L.A/C. W. F. Rusk, 966122; L.A/C. R. C. Whitley, 968138

DIED ON ACTIVE SERVICE.—A/C.1 A. H. Anns, 633160; A/C.2 A. Armstrong, 997488; A/C.1 C. F. Blyth, 907481; Cpl. W. Brown, 532583; Sgt. J. D. Cross, 742933; A/C2 W. G. Garner 951796; L.A/C. A. L. A. Gawith, 901704; A/C.2 A. J. Hobbs, 925137; L.A/C. E. Hodge, 635433; A/C.1 G. W. Hutton, 937160; F/O. L. T. Kinchin, 78405; L.A/C. N. Lawley, 526506; A/C.2 C. G. M. Leaver, 1257863; L.A/C. K. Painter, 645628; A/C.2 G. E. Pound, 1055450; L.A./C. E. Reardon, 63684; A/C.2 A. Reynard, 1174649; Sgt. T. F. Rowe, 742816; A/C.2 P. Rudden, 973370; A/C.2 J. L. Rutter, 1162473; L.A/C. E. Smith, 307747;

OVER MELBOURNE: A Wirraway—a Harvard in this country—of the Royal Australian Air Force. Note the two forward machine guns mounted on the top of the fuselage and firing through the airscrew disc.

SERVICE AVIATION (CONTINUED)

A/C.2 T. Smith, 994668; Cpl. W. J. Smith, 849877; A/C.2 E. C. Speake, 1166056; L.A/C. H. K Spencer, 517191; A/C.2 E. S. H. Underwood, 1135529; L.A/C. S. H. Wakelam, 959972; Cpl. R. F. Warren, 569297; Act. Flt. Lt. W. K. Williams, 37704; A/C.2 C. H. Young, 949726.

PREVIOUSLY REPORTED "MISSING." NOW REPORTED "PRISONER OF WAR."—Sgt. M. R. Chouler, 580944; Sgt. B. M. D'Arcy, 561093; P/O. D. K. Hayes, 42836; P/O. T. M. Kane, 41185; Flt. Sgt. H. N. Norris, 565646.

Royal New Zealand Air Force

KILLED IN ACTION. — Sgt. D. E. Hughes, NZ40920.

MISSING.—Sgt. C. H. L. Newbery, NZ40726.

Prisoners of War

NEXT of kin, if able to identify the men from the information published, are requested to advise the Casualty Branches of the Services concerned, forwarding Regimental or any other details.

The following is the latest list of British prisoners of war as received from enemy sources:—

IN GERMAN HANDS.

Sgt. D. Windel, 7, Park Avenue, Osthorpe, Leeds. Sqn. Ldr. E. D. Elliot (first reported wounded, now quite well), Gerrards Cross, Bucks. Sgt. A. Heslack, Royal Hotel, Inverness. Sgt. E. H. Platts, Manor Estate, Sheffield. Sgt. J. N. Prendergast, Bromborough, Cheshire.

London Gazette

Royal Air Force

Air Vice-Marshal (temporary Air Marshal) Sir Charles Frederick Algernon Portal, K.C.B., D.S.O., M.C., is appointed Chief of the Air Staff, vice Marshal of the Royal Air Force Sir Cyril Louis Norton Newall, G.C.B., C.M.G., C.B.E., A.M., and is granted the acting rank of Air Chief Marshal (Oct. 25, 1940).

General Duties Branch.

Flt. Lt. (temp. Sqn. Ldr.) G. L. Cruikshanks is granted a permanent commission in the substantive rank of Flight Lieutenant (April 3).

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Sergeants: (Sept. 28, Sen. Sept. 18) M. A. Terraneau; (Oct. 1, Sen. Sept. 11) A. E. Rumble; (Oct. 8, Sen. Sept. 18) W. S. Herring.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(June 25) D. R. Chance; (Aug. 17) A. R. Pruddah; (Sept. 3) L. V. James, L. M. Blome-Jones, L. L. Johnston, J. P. Wells, E. C. Inglefield, L. Gregory, J. W. Monk, R. A. L. Knight, J. R. Havers, H. F. Wood, D. D. A. Kelly, P. Tomlinson, H. R. MacD. Beall, W. B. Baxter, J. A. Ingram, D.F.C., A. L. Vipan, G. H. D. Evans, J. M. Bodman, H. R. A. De Belleroche, D. E. Cremin, L. T. Wallis; (Sept. 10) A. M. Young; (Sept. 15) J. A. Slater; (Oct. 15) G. F. Brotchie, J. C. Stevenson.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Aug. 29) P. M. Gardner, D.F.C.; (Sept. 3) A. R. D. Barratt, P. J. C. Harper, J. Swyers, J. Barraclough, D. G. Long, B. Willoughby, J. H. Kennard, E. F. J. Charles, V. G. D. Spiller, G. M. Kelly, R. E. B. White, C. W. A. H. Rafter, C. H. Elliot, F. G. Potts, P. E. A. Carr, H. L. Oakley, G. T. Baynham, R. S. H. Hook; (Oct. 6) S. W. Griffiths; (Oct. 21) P. H. Hugo, D.F.C., D. F. Wilson, J. A. Harries; (Oct. 23) L. D. M. Scott.

F/O. C. S. Thomas takes rank and precedence as if his appointment as Flying Officer bore date June 4, 1939. Reduction to take effect from July 9.

Wing Cdr. E. R. Vaisey is placed on the retired list (Oct. 17).

P/O. on probation V. H. Rowan relinquishes his short service commission on appointment to a commission in the R.A.F.V.R. (July 23).

The commission of P/O. on probation G. W. Forster is terminated on cessation of duty (Oct. 1).

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities:—As Flying Officers on probation: Warrant Officers: (June 20, Sen. May 23) A. G. Haggar; (July 17, Sen. May 9) W. McBride. As Pilot Officers on probation: Flight Sergeants: (Oct. 8, Sen. Sept. 10) J. A. Browning; (Oct. 9, Sen. May 16) C. H. Fuller. Sergeant: (Sept. 28, Sen. May 30) P. C. Mortimore. Corporal: (Aug. 21) A. E. Jaquemet.

The undermentioned Flying Officers on probation are confirmed in their appointments:—(June 12) H. Vatcher, M.B.E.; (June 19) G. Prigmore; (June 23) J. McQ. Fitch; (July 27) G. Baldwin; (Aug. 15) W. H. C. Syzling; (Oct. 11) H. Walters.

Flt. Lt. W. R. Heywood (ret.) is promoted to the rank of Squadron Leader (temp.) (Sept. 1).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(May 18) I. F. Chambers, H. Cadman, A.F.M.; (June 3, Sen. May 18) D. J. Day, H. E. Brushwood; (July 15, Sen. May 18) A. E. Davies; (Aug. 30, Sen. Aug. 23) H. Barnes.

Balloon Branch.

Cpl. F. L. S. Miller is granted a commission for the duration of hostilities as Pilot Officer on probation (Sept. 25, Sen. Sept. 12).

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities:—As Flying Officers on probation; Warrant Officers: (Sept. 28, Sen. Aug. 19) W. N. Nicklin; (Sept. 30, Sen. Sept. 13) D. Driscoll; (Oct. 10, Sen. Sept. 9) A. Brassington. As Pilot Officers on probation: Warrant Officer: (Oct. 3, Sen. Sept. 13) G. McKenna. Flight Sergeants: (Sept. 20, Sen. April 25) A. McP. Cameron; (Sept. 1, Sen. Sept. 6) W. H. Bentley. Corporals: (Sept. 23, Sen. July 3) J. H. Sewell; (Oct. 1, Sen. Aug. 16) R. T. Alkin; (Oct. 2, Sen. May 16) R. F. J. Barber, H. Bentley.

P/O. on probation D. G. Foreman is promoted to the rank of Flying Officer on probation (Oct. 6).

Equipment Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation (Sept. 28):—Flight Sergeant: (Sen. July 23) F. P. Connolly. Sergeants: (Sen. July 10) A. M. R. Ramsden, A. Wilson, W. C. E. Swadling. Corporal: (Sen. July 10) R. E. Gollop. Leading Aircraftman: (Sen. July 10) R. J. Jenkins.

F/O. on probation T. H. C. Hampton is confirmed in his appointment (Sept. 18).

P/O. on probation I. H. Matheson is confirmed in his appointment (Aug. 17) and promoted to the rank of Flying Officer (Oct. 17).

Flt. Lt. J. S. Eley is promoted to the rank of Squadron Leader (temp.) (Sept. 1).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant (Sept. 4):—T. C. Wharfe, L. S. Rutley, A. H. Brown, F. J. Gracey.

P/O. G. E. Tweddle is promoted to the rank of Flying Officer (July 3).

Group Capt. L. Auker, C.B.E., is placed on the retired list (Oct. 21).

Accountant Branch.

The undermentioned Act. Pilot Officers on probation are graded as Pilot Officers on probation (Sept. 21): J. B. Harrison, W. L. Collis.

Medical Branch.

Flt. Lt. O. S. M. Williams, M.R.C.S., L.R.C.P., D.A., is promoted to the rank of Squadron Leader (Oct. 16).

The undermentioned are appointed as Medical Officers with the relative rank of Flying Officer: (Oct. 1) Miss B. A. Briant, M.B., B.S., M.R.C.S., L.R.C.P., Mrs. A. L. J. Dovey, M.B., Ch.B., Miss M. I. Macnaughton-Jones, M.D., B.S., M.R.C.S., L.R.C.P., Miss J. H. Morton, M.D., Ch.B., D.P.H.

Dental Branch.

Flt. Lt. R. G. J. Charlesworth, L.D.S., is promoted to the rank of Squadron Leader (July 1).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

Lt.-Col. J. A. Ferguson, O.B.E., I.A. (ret.), relinquishes his commission as Wing Cdr. in class CC., June 30, and is granted a commission as Flight Lieutenant in class CC from June 30 to Sept. 28, inclusive.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 3) A. C. Pearson, D. B. Smith, B. R. Tribe; (Sept. 5) G. L. Malcolmson; (Sept. 8) G. Crump; (Sept. 30) A. D. Frank.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Sept. 3) D. C. Nicholl; (Sept. 10) H. Mitchell, A.F.M.; (Oct. 24) C. J. Laubscher.

Flt. Lt. R. W. Tobin is granted the rank of Squadron Leader (Nov. 11, 1939).

F/O. P. D. Baker is granted the rank of Flight Lieutenant (Feb. 28), and the rank of Squadron Leader (Sept. 30).

F/O. B. W. E. R. Bonsey is transferred to the Administrative and Special Duties Branch (Oct. 15).

The undermentioned relinquish their commissions in class CC on appointment to commissions in the R.A.F.V.R.:—Squadron Leaders: (Oct. 10) F. J. Sherman; (Oct. 16) F. A. Latter; (Oct. 17) S. G. S. Skene, R. W. Tobin. Flight Lieutenant: (Sept. 17) G. E. D. Low.

Administrative and Special Duties Branch.

F/O. H. C. Biard is transferred to the General Duties Branch (Aug. 1).

Royal Air Force Volunteer Reserve

General Duties Branch.

The undermentioned are granted commissions for the duration of hostilities:—As Pilot Officers on Probation: (Sept. 2) I. C. Rushton; (Oct. 1) G. A. Reston; (Oct. 7) G. R. Carpenter, E. G. Davis, G. W. Fairbank, R. F. T. Granger, E. H. Henson, C. H. Holyoake, C. H. R. Lagesse, R. Mount; (Oct. 14) G. de H. Vaizey, J. C. Weale. Sergeants: (Aug. 17) F. B. Yard; (Oct. 5, Sen. Sept. 25) R. H. Brinton; (Oct. 6) D. S. Brooke, P. B. G. Davies, A. Carey-Hill, M. J. Gidman, G. H. Hadland, A. J. Heathfield, D. R. A. Michael; (Oct. 7, Sen. Oct. 4) H. M. P. Ashby; (Oct. 9, Sen. Oct. 6) I. R. Currie, W. H. Ireson. Leading Aircraftmen: (Sept. 22) P. L. O'N. Morris, L. C. Wellman, P. A. Leuw, E. G. Stokes. As Acting Pilot Officers on Probation: (Sept. 13) J. C. D. Squibb; (Sept. 20) C. J. T. Gardner.

The undermentioned Act. Pilot Officers on probation are graded as Pilot Officers on probation: (Aug. 24) D. G. H. McDonald, J. L. Harms.

P/O. on probation A. J. Cormack is confirmed in his appointment and promoted to the rank of Flying Officer (Sept. 3).

P/O. on probation J. R. King is confirmed in his appointment and promoted to the rank of Flying Officer (Oct. 24).

P/O. R. G. A. Barclay is promoted to the rank of Flying Officer (Oct. 3).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant: (Sept. 3) W. H. Carr-Birbeck; (Sept. 18) W. H. M. Walker.

The undermentioned Pilot Officers on probation are transferred to the Administrative and Special Duties Branch: (July 12) H. E. Oakshott; (Oct. 15) K. J. Nalson; (Oct. 22) G. S. Blacker.

The Commission of P/O. on probation V. J. Somerset-Thomas is terminated on cessation of duty (Sept. 24)

Erratum.

In the *Gazette* of Sept. 13 notification concerning A. S. Collinson, rank should read "P/O. on probation."

Technical Branch.

F/O. E. Taylor, R.A.F.O. is granted a commission as Flight Lieutenant (Oct. 10, Sen. April 25).

RETURN VISIT: Pilots from a fighter squadron paying a call at an aircraft factory in return for a visit by the aircraft workers to their aerodrome.

SERVICE AVIATION (CONTINUED)

Balloon Branch.

The undermentioned are granted commissions for the duration of hostilities: As Pilot Officers on probation:—Flight Sergeants: (Aug. 24, Sen. Aug. 8) R. A. B. Thomas. Sergeants: (Sept. 16, Sen. Sept. 5) K. S. Clarke; (Sept. 24, Sen. Sept. 4) L. H. Heather; (Sept. 30) F. F. Downe. Corporals: (Sept. 27, Sen. Sept. 16) J. A. Gulland; (Sept. 28, Sen. Sept. 12) E. Hughes. Leading Aircraftmen: (Sept. A. 28, Sen. Sept. 12) A. G. Wood, L. F. Wood. Aircraftmen 1st Class: (Sept. 25, Sen. Sept. 5) D. L. Cuthbert; (Sept. 27, Sen. Sept. 16) J. A Laurillard; (Sept. 28, Sen. Sept. 12) R. C. Norton; (Sept. 29, Sen. Sept. 4) J. H. K. Baerselman; (Oct. 5, Sen. Sept. 16) M. A. Davids. Aircraftmen 2nd Class: (July 3, Sen. June 25) L. B. Longley; (July 16, Sen. June 27) J. C. Shaw. As Acting Pilot Officers on probation:—Corporal: (Sept. 27, Sen. Sept. 13) E. G. Roost. Leading Aircraftmen: (Sept. 30, Sen. Sept. 16) M. G. Kirke; (Oct. 14, Sen. Sept. 30) R. McSwein.

The undermentioned Pilot Officers are confirmed in their appointments: (Sept. 3) W. M. Frew, W. M. Jack.

The undermentioned Pilot Officers are confirmed in their appointments and promoted to the rank of Flying Officer: (Sept. 3) F. D. Lyle; (Sept. 4) R. M. Cook, A. S. Newey; (Sept. 26) A. L. Aldridge, C. K. Studd.

Administrative and Special Duties Branch.

The undermentioned are granted commissions as Flight Lieutenants:—(Sept. 17, sen. July 6, 1939) G. E. D. Low; (Oct. 10, sen. Mar. 20, 1939) F. J. Sherman, Capt., S.U.L.I.A.; (Oct. 16, sen. June 28, 1939) F. A. Latter, Maj., S.U.L.I.A.; (Oct. 17, sen. June 2, 1939) R. W. Tobin, Maj., S.U.L.I.A.; (Oct. 17) S. G. S. Skene, Maj., S.U.L.I.A.

The undermentioned are granted commissions for the duration of hostilities:—As Pilot Officers on probation: (June 19) D. L. Rankin; (June 25) R. W. B. Warneford; (July 1) G. M. Ellison, G. C. V. Fenton, G. Millington, J. C. Stephens; (July 2) T. de B. Carey, H. G. Grace, S. T. Holland; (July 3) A. C. H. Alford; (July 4) C. Morley; (July 9) R. J. Parkhouse; (July 16) R. R. W. Hogg, C.I.E., O.B.E., C. J. Kirlew; (July 18) C. Glossop; (July 23) V. H. Rowan; (Aug. 7) I. H. Mason; (Aug. 9) R. J. Mudie; (Aug. 12) C. W. Allen; (Aug. 13) D. B. McDonald; (Aug. 16) J. C. D. Hope; (Aug. 23) L. R. Forster; (Sept. 4) E. R. Inkpen, J. A. Power; (Sept. 6) H. Sutcliffe. (Sept. 20) M. Archdale-Vicars, W. Bailey, L. G. Bannerman, R. E. Beal, H. L. Bevan, E. J. Black, K. J. Bolton, E. P. Bourdeaux, J. Burdon, W. J. Delaney, R. Dewhurst, H. K. Evershed, J. H. Fisher, C. H. P. Florence, W. Forsyth, R. E. F. Gardner, W. J. K. Gibson, G. W. S. Griffin, J. E. Gurdon, J. B. Hewitson, W. D. Johnston, C. M. Johnstone, A. Kyle, C. V. Lezard, H. J. Mackenzie Wood, G. E. Mason, S. D. McDonald, J. D. de S. McElwain, R. D. McQueen, F. Mellor, H. Miles, G. E. Moore, J. H. A. Muirhead, D. E. O'Bryen, A. A. Old, H. A. Packham, F. N. Pannell, D. R. B. Park, D. J. Parsons, E. V. S. Pavillard, C. G. Pickering, J. G. Russell, C. W. Slatter, T. C. Sumner, R. H. Thomas, T. J. Tingley, T. A. V. Willigen, L. E. West, H. White, H. F. Widdas, J. A. J. R. L. Withnell, O. D. Wood; (Sept. 23) G. A. Anderson; (Sept. 24) H. M. Smith; (Sept. 25) G. D. Britton, S. H. Evans; (Sept. 27) E. W. L. Agar, S. Ashton, F. Baird, B. M. U. Bennell, A. W. Bennett, A. J. Berkin, H. C. Brown, A. D. Buchanan, K. R. Bull, J. B. V. Burgis, W. H. K. Camm, A. Charles, J. A. Easthope, H. E. Edwards, A. H. Ellis, D. F. Fairbairn, A. G. Forrester, F. S. Fry, J. Gamon, D.S.C., G. R. H. Geoghegan, P. F. Gillies, J. B. Clark, I. C. R. Coombe, F. C. Cooper, P. E. Davis, L. B. Dickinson, F. H. Goldsmith, R. P. Greenwood, A. N. W. Griffiths, H. Harber, E. Illingworth, A. Jennings, W. H. Jewell, R. Jones, B. Joy, R. H. Laver, C. W. Lawrence, W. S. H. Maclachlan, F. H. Maddox, W. Y. McNair, D. W. Millard, P. P. Muller, J. L. Nock, V. O'Driscoll, D. C. Petheram, J. Richards, J. Soper, S. W. Swanbury, M. T. Thein, O. N. Thompson, W. B. Walker, G. G. Wingfield, F. W. Wort; (Sept. 28) S. Helmy, J. W. Moll, G. de C. M. Taylor; (Sept. 29) F. H. E. Read,; (Sept. 30) G. A. Bird, D. L. R. Guthrie, C. C. L. Nielsen, R. J. Paul, F. V. Tattersall, R. T. E. Wood; (Oct. 1) M. de J. Creswick, J. T. Dickinson, A. C. G. Menzies; (Oct. 2) B. Drew, B. F. Eyson, R. Hatton; (Oct. 3) T. Capps, R. G. Cherry, H. Edwards, A. P. Hudson, H. P. Jones, P. S. Ransom, D. S. F. Vernon, A. J. Allnutt, E. A. Wills; (Oct. 4) M. W. N. Abbott, T. Andrews, R. F. Arnold, H. H. B. Beacon, J. H. Billington, C. S. Brown, C. A. Capon, A. S. Cash, H. R. Chatterton, S. G. U. Considine, T. G. Danby, F. Davies, A. C. Davis, F. Dixon, J. F. Drabble, M. J. Edwards, T. Evans, B. W. Fowler, S. B. S. Fowler, G. H. A. Freear, M. S. Gates, A. G. Greatrex, P. D. Greenall, N. F. Henlé, F. F. Howard, N. Hutchison, L. S. Jay, A. N. Kinnear, R. H. E. Lees, A. J. Lindsey, R. A. Lolley, R. D. Mainwaring, B. B. Marshall, H. W. Merckel, E. A. Natzio, J. D. Nicholson, H. C. Neville, H. I. K. Owen, R. W. Pite, G. G. Reeves, T. W. Rossiter, I. J. Sahni, R. J. H. Seath, A. B. S. Thomson, A. A. Thorne, F. K. Turner, C. G. Walkden, A. B. Walton, O. H. Wright; (Oct. 5) F. J. F. Fox, T. Jenkins, A. S. H. Mills, F. R. Swynnerton; (Oct. 6 C. C. Harland; (Oct. 7) R. Ashton, G. V. Baxter, L. W. Hall, R. J. La Fontaine, H. J. Mackaness, E. D. Saul, J. H. Smith, H. J. D. Talling; (Oct. 8) V. H. Buscall, A. Connell, W. F. Cross, H. F. David, J. C. Gent, A. C. Handford, G. Hamilton, F. C. Webber; (Oct. 9) R. G. Biggs, J. F. R. Day, W. P. B. Hollis, B. M. Welham, R. E. West, H. Wright; (Oct. 10) S. G. Burdick, R. N. H. Fraser, L. N. Graham, C. F. Jones, L. J. C. Wharton; (Oct. 12) E. Hopcraft; (Oct. 14) R. S. Melsom. Sergeants:—(Sept. 30, Sen., Aug. 27) A. R. Albrecht; (Oct. 5, Sen. Sept. 9) W. B. Moon. Corporals: (Sept. 27, Sen. Aug. 27) F. S. Prior; (Sept. 27, Sen. Sept. 10) H. H. Hester; (Sept. 30, Sen. Aug. 27) G. W. Brown; (Oct. 4, Sen. Aug. 20) G. W. M. Dunn; (Oct. 4, Sen. Sept. 13) W. S. Grace; (Oct. 5, Sen. Aug. 30) T. H. Roam; (Oct. 8, Sen. Sept. 16) J. C. Carruthers. Leading Aircraftmen: (Aug. 22, Sen. Aug. 13) N. Wilkinson; (Sept. 26, Sen. Aug 6) I. Stewart; (Sept. 30, Sen. Aug. 16) F. R. Carter; (Sept. 30, Sen. Aug. 28) N. H. Archer. Aircraftmen 1st Class: (Sept. 9, Sen. July 29) A. H. White; (Sept. 14, Sen. Aug. 27) T. R. Kennedy. Aircraftmen 2nd Class: (May 11, Sen. April 25) J. E. B. Simeon; (July 28, Sen. May 30, H. W. Simpson; (Aug. 30, Sen. July 29), P. V. Truscott; (Sept. 30, Sen. Aug. 20) A. R. Barr as Acting Pilot Officers on probation: (Aug. 4) K. Barry, N. E. Browning, J. Finney, J. M. D. Gauntlett, C. G. L. Hutchinson, H. P. Jacob, W. Llowarch, E. G. May, I. D. McIntosh, M. C. Nokes, S. R. Pollard, O. R. C. Prior, L. D. Stewart; (Aug. 8) G. F. Green; (Aug. 18) V. R. C. Brown, H. Forrest, P. E. Peters, J. L. Ryder, T. H. Smyth; (Oct. 1) H. E. Reekie; (Oct. 9) G. C. Beamish. Aircraftman 1st Class): (Sept. 28, Sen. Aug. 19) F. M. Naylor.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation: Warrant Officer: (Sept. 4, Sen. Aug. 13) R. S. Sweetlove. Flight Sergeants: (Aug. 2, Sen. June 20) R. Mallett; (Aug. 25, Sen. Aug. 13) H. C. F. Fletcher; (Sept. 5, Sen. Aug. 15) A. S. Flatters. Corporal: (Aug. 8, Sen. July 1) G. A. P. Duhy.

(Substituted for notification concerning these officers in the *Gazette* of Sept. 27.)

F. B. Kipling is granted an honorary commission as Wing Commander, Oct. 22. (Substituted for the notification in the *Gazette* of June 4.)

F/O. on probation P. F. Picton is confirmed in his appointment, Aug. 10.

The undermentioned Pilot Officers on probation are confirmed in their appointments: (Sept. 3) A. L. Bryson; (Sept. 5) N. Harper; (Sept. 19) D. H. King; H. J. Oughton; (Sept. 26) W. E. J. Barry, J. E. H. Chadwick, E. G. Gough; (Oct. 4) F. R. Offord.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer: (Sept. 3) W. A. MacKenzie; (Sept. 10) F. A. Strachan; (Sept. 19) L. H. Brown, R. V. Dickins, J. C. Emerson, H. A. Hewitt, C. H. Leng, J. W. Maddock, D. J. Wiseman; (Sept. 26) C. H. Anstey, W. L. Brewer, R. Caldecott, G. E. G. Dixon, W. E. Newman, C. F. Rogers.

P/O. M. K. Forsyth is promoted to the rank of Flying Officer, Sept. 19.

The undermentioned Pilot Officers are transferred to the Technical Branch: (April 24) W. H. Foster, J. B. Flynn, J. N. H. Brooke, H. W. Paterson. H. H. Greig; (April 27) J. A. Bradley; (April 29) L. Wynne-Owen; (June 12) W. L. Gordon; (June 17) W. Beattie; (June 22) H. Royston; (June 29) J. L. Western; (July 22) R. Stalleb-ass); (July 23) L. S. Davies; (July 25) W. G. Fatherley, C. R. Guv, A. H. Pooley, A. W. Dale A. O. Marshall; (Aug. 7) S. J. Wood; (Aug. 29) I. A. F. Donnelly.

P/O. on probation G. H. Long relinquishes his commission on account of ill-health. Oct. 29.

The undermentioned Pilot Officers on probation relinquish their commissions on appointment to commissions in the Army: A. A. Bankier; (Oct. 14) A. C. Alford.

Sq. Ldr. A. P. Ryan reliquishes his honorary commission. Oct. 19.

The undermentioned resign their commissions: Pilot Officers: (Oct. 21) R. Landau, A. A. Ferguson. Pilot Officers on probation: (Sept. 11) O. W. Crichon; (Oct. 6) C. Trenchard; (Oct. 13) J. O. Hunt, C. S. Wagstaff; (Oct. 15) A. H. Beech; (Oct. 21) W. W. Home.

The commissions of the undermentioned Pilot Officers on probation are terminated on cessation of duty:—(Sept. 5) F. K. Hensley; (Sept. 25) J. C. Barrack, J. H. Lowson; (Sept. 28) W. D. Ferguson, R. O. Bettington; (Oct. 1) W. L. Graham, J. Skinner; (Oct. 4) E. F. Howard; (Oct. 6) F. T. Walker, G. Williams, K. Anderson; (Oct. 8) P. A. G. Macarthy; (Oct. 9) R. S. Wray.

Meteorological Branch.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Aug. 1) J. Bell, G. A. Darlow, B. F. Drew, S. F. Hann, R. Honeybone, H. H. J. Leigh-Clare, H. A. Matthews, R. J. Murgatroyd, W. A. Perkins, S. W. Slaughter, W. F. Spinks, J. E. Thomas, E. H. Varley, H. L. Walker, W. H. Weaver; (Aug. 8) A. F. E. Cotton, J. C. Lawrence, L. R. Morey; (Aug. 25) H. Hanks.

P/O. on probation M. K. Miles is confirmed in his appointment, Aug. 1, and promoted to the rank of Flying Officer, Sept. 30.

Equipment Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—(Sept. 28) C. G. Walton. Sergeant: (Sen. July 10) J. W. Townsend. Corporal: (Sen. July 23) F. S. Montague. Leading Aircraftmen (Sen. July 10) J. H. Brown, F. R. Cook; (Sen. July 23) R. J. Sullivan. Aircraftmen 1st class: (Sen. July 10) W. J. R. Pincott; (Sen., July 23) C. A. Case, R. H. Cutmore. Aircraftman 2nd class: (Sen., July 23) A. F. H. Norris.

The undermentioned Act. Pilot Officers on probation are graded as Pilot Officers on probation:—(July 24) S. Proctor; (July 26) S. W. Hornibrook.

P/O. in probation J. W. Bush is confirmed in his appointment and promoted to the rank of Flying Officer (Sept. 11).

Accountant Branch.

M. E. Graham is granted a commission for the duration of hostilities as Act. Pilot Officer on probation (Sept. 4).

The undermentioned Act. Pilot Officers on probation are graded as Pilot Officers on probation:—(Aug. 5) C. H. Nicholson; (Aug. 9) A. W. Bennell; (Sept. 21) K. V. Moss, G. Ruthven, G. C. Millichamp, S. Beaumont-Smith, H. Eason, J. F. Humphreys, D. Barker, V. L. Barrow, J. Bland, J. G. Chandler, E. Driver, J. Foster, J. E. Garrish, J. V. Hadow, A. J. Harris, C. F. N. Harrison, J. Hill, H. B. Hunt, K. F. James, A. A. Logan, A. L. Monkhouse, E. H. Newman, S. V. Pearce, F. A. Ross, C. Sephton, F. Sharpe, G. W. Shearn, W. A. Stoker, G. E. Stone, G. H. Summers, A. J. Talbot, I. Turner, T. W. Tyrrell, T. S. Wallace, H. R. Weaver.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Sep. 17) T. H. Sellar; (Oct. 6) C. P. Lister.

Medical Branch.

The undermentioned are granted commissions for the duration of hostilities:—As Flight Lieutenants: (Oct. 1) M. P Embrey, M.D., F.R.C.S. (Ed.), M.R.C.O.G.; J. C. Gilson, M.B., B.Chir., M.R.C.P., M.R.C.S.; (Oct. 8) M. G. Nelson, M.D., B.Ch., M.R.C.P. As Flying Officers: (Oct. 1) J. R. Belcher, M.B., B.S., M.R.C.S., L.R.C.P.; L. H. Blakelock, M.R.C.S., L.R.C.P.; J. M. Bowen, M.B., B.Ch.; E. S. Brawn, M.R.C.S., L.R.C.P.; R. H. Carpenter, M.B., B.S., M.R.C.S., L.R.C.P.; I. A. Donaldson, M.B., B.S., M.R.C.S., L.R.C.P.; J. B. Franklin, M.B., B.S., M.R.C.S., L.R.C.P.; R. N. Grant, M.R.C.S., L.R.C.P.; J. L. Hamilton, M.B., Ch.B.; D. W. Higson, M.R.C.S., L.R.C.P.; W. Huey, M.B., Ch.B.; B. L. N. Morgan, M.B., B.S., M.R.C.S., L.R.C.P.; I. Pierce-Williams, M.B., Ch.B.; A. F. Rutherford, M.B., Ch.B.; L. D. Rutter, M.B., Ch.B.; A. L. Watson, B.M., B.Ch.; (Oct. 8) A. L. Basham, M.B., B.S., M.R.C.S., L.R.C.P.; F. Boyd, M.B., B.Ch.; J. H. Browne, M.B., B.Ch.; B. Cantor, M.B., Ch.B.; J. E. Cawthorne, M.R.C.S., L.R.C.P.; J. R. Graham, M.B., B.Ch.; G. H. Grant, B.M., B.Ch., M.R.C.S., L.R.C.P.; R. S. Harbinson, M.B., B.S.; J. N. Loring, M.R.C.S., L.R.C.P.; R. A. C. Macnair, M.B., Ch.B.; I. Mazure, M.R.C.S., L.R.C.P.; W. R. K. M. Parry, M.R.C.S., L.R.C.P.; I. C. B. Pearce, B.M., B.Ch., M.R.C.S., L.R.C.P.; C. W. Petrie, M.B. Ch.B.; A. H. Pritchard, M.R.C.S., L.R.C.P.; B. J. O. Winfield, M.B., B.Chir.; (Oct. 10) W. J. Lynd, M.B., B.Ch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—(Sept. 22) N. S. Taggart, M.R.C.S., L.R.C.P.; (Sept. 27) J. H. P. Gauvain, M.R.C.S., L.R.C.P.; N. A. A. Cust, M.D., B.S.; (Sept. 28) H. W. Whittingham, M.B., Ch.B., M.R.C.S., L.R.C.P.; (Oct. 2) F. L. Patterson, M.R.C.S., L.R.C.P.; (Oct. 12) D. M. Anderson, M.D., Ch.B.; (Oct. 24) D. H. Fowler, L.M.S.S.A.

Dental Branch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:— (Aug. 29) J. W. Cunningham, L.D.S., R.F.P.S.; (Sept. 6) E. J. Dunford, L.D.S., R.C.S.; (Sept. 17) F. J. Edgell, L.D.S.; (Sept. 29) P. L. Lamb, L.D.S.; (Oct. 2) I. H. Fleming, L.D.S.

Chaplains Branch.

The undermentioned are granted commissions for the duration of hostilities with the relative rank of Squadron Leader:—(Oct. 7) The Rev. R. L. Handford, The Rev. W. J. Murray, M.A.; (Oct. 11) The Rev. I. T. Daniel, B.A., The Rev. F. H. de Jonge, B.A., The Rev. E. P. Grimwade; (Oct. 16) The Rev. D. G. Hazlitt.

Auxiliary Air Force

General Duties Branch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 3) C. B. Thompson, D. L. Clackson, C. A. Pritchard, E. S. Smith, T. N. Hayes, D.F.C., C. R. Davis, D.F.C., A. H. H. Tollemache, E.G.M., W. H. Rhodes-Moorehouse, D.F.C., H. J. Riddle, J. G. C. Barnes, J. R. H. Gayner, E. F. St. Aubyn.

Balloon Branch.

The undermentioned Flying Officers are promoted to the rank of Flying Officer:—(Sept. 3) A. J. D. McArthur, W. J. W. Kettlewell, T. P. Wheelock.

Administrative and Special Duties Branch.

P/O. C. A. Potter is promoted to the rank of Flying Officer (Aug. 20).

Accountant Branch.

The undermentioned Flying Officers are promoted to the rank of Flying Officer:—(Sept. 3) J. W. R. Murray, L. A. W. Hawkins.

Women's Auxiliary Air Force

The undermentioned are appointed Assist. Section Officers:—(Oct. 20) Cpl. Mrs. M. I. Brown, A/CW.1 Miss I. Cole, Sgt. Mrs. B. M. Garrad-Cole, A/CW.2 Miss W. Skidmore.

The undermentioned Assist. Section Officers relinquish their appointments:—(Oct. 7) Miss E. M. Love; (Oct. 16) Mrs. C. M. Riddell; (Oct. 21) Miss M. H. Newton.

Supplement to FLIGHT

THE AIRCRAFT ENGINEER

No. 177. (Volume XIX No. 10) 15th Year November 7, 1940.

THE CASE FOR THE SINGLE-BLADED ROTOR

By J. LAUDERDALE

(*Continued from page 277, October 3, 1940*)

WE have not yet considered the case for stopping the blade in the air. Let us assume the blade revolving in the air. With the design of blade which is set at a negative angle of about 5 deg. the blade will only continue to revolve while the machine is flying at a large angle, because then the rotor blade is in its most favourable position and will be producing the most lift and forward component. As the machine increases speed the angle of it to the airflow will become less and, considering the rotation-producing portion of the arc of the circle, the angle of the blade in this area will become smaller. Eventually the forward component of the air forces will get less, the profile drag of the aerofoil will become proportionately greater, and the speed of rotation over this area will drop. When the machine reaches its normal flying angle the blade will be at — 5 deg. in this area. If it is still rotating, due to inertia, there will be no forward component in this area but only drag, and therefore the blade will eventually stop and trail backwards in the airflow. It may tend to oscillate rearwards of the pivot before it finally settles down, but these oscillations should not be dangerous.

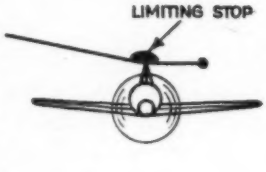


FIG. 9

It now remains to prove that a structure can be made strong enough to withstand the bending moment set up at the root of the blade, in the most favourable position of lift, at the maximum lift angle of the blade when the machine is flying at a speed slightly above its stalling speed. The blade is assumed to be stopped in a position at right angles to the airflow, and to have come against a stop which limits the coning angle (see Fig. 9).

This may never become an actual case, but it is used to demonstrate that it would be possible to construct such a blade to withstand these loads. The offset moment on the aeroplane as a whole would not proportionately be of great magnitude, and would only exist for a small period of time till it went over the dead centre position.

A machine of this type is shown in Fig. 10. Developments on the basic scheme could give further advantages or could enable larger machines to be built. The most obvious change would be to design a blade mechanism which would allow the angle of the blade to be controlled in flight and also to be driven by the engine through a clutch. If the motor was sufficiently powerful the blade would be made to act as a pure helicopter for take-off purposes. The lift and power required can then be directly calculated.

The machine could then take off directly from the ground, and when it had climbed a reasonable height the rotor, being only single-bladed, could be made to do either of two things after the power had been cut off. (1) It could be allowed to slow down at the same angle of attack, in which case the machine would, of course, commence to sink. The nose would drop, and as the machine gained forward speed the resultant of lift and drag on the blade would be behind the axis of rotation. As it was arranged for helicoption at a positive angle of attack, the blade would trail behind the axis. This could be ensured by increasing the angle of the blade till it stalled on the forward sweep, if there was any tendency to autorotate. The machine would now be a normal aeroplane of high wing loading.

(2) When the power was cut off, the angle of the blade would be reduced to a negative angle in relation to the rotor axis, so that it would autorotate when the nose of the machine was held up. Under these conditions the blade could be stopped by just dropping the nose of the machine, so that the blade produced no autorotative component of the lift force once it had passed the no-lift angle of the blade. The segment of the arc of rotation considered is always that shown in Fig. 3.

Automatic Operation

It must be remembered that if the blade of this rotor system is not locked in position, its operation to control the stall is absolutely automatic. Thus if the machine is held at its normal flying position, and is flying fast, the blade is trailing in the airstream behind the axis of rotation. If the machine is then slowed down by raising the nose, and an angle close to the stall is reached, the blade automatically starts rotating and thereby checks the approaching stall. The machine fitted with the blade of controllable angle would have greater control over the autorotative flight, and if fitted with a motor drive and clutch, could also hover. If the scheme could be developed sufficiently it would be possible to design a machine which could fly at speeds faster than present clean monoplanes of the same power, but necessarily lower wing loadings, and also to hover in the air and land at no forward speed at all.

From a practical point of view it is easy to visualise how a single-bladed rotor could be made to stop in the air, but the converse is not quite so obvious. In either case it is probable that alternating accelerations and decelerations of fair magnitude would take place on the blade as it reached different positions of its circle of rotation, but these need not result in dangerous loads. For instance,

when the blade is started in the air it will commence to rotate so that its angle of attack when moving forward is low. The centrifugal force on the blade at the start would not be very large, and not of such a magnitude that it would be sufficient to form a component to give a reasonable coning angle. At this stage, therefore, it would be necessary to rely on the blade being lifted to a stop so that the angle would be just above that of the maximum permissible coning angle. Now the lift forces would be as small as possible, and they would be supported by the strength, in bending, of the rotor blade spar. The strength of this, however, would be such that it would be capable of supporting the whole of the lift of the blade if it were at the angle of maximum lift, at slightly above the stalling speed of the aircraft, should this case arise accidently. When the blade had passed the forward dead-centre position on the first revolution it would accelerate quickly on the backwards stroke, due to the drag of the blade, and as it began the second revolution it would have a certain amount of inertia and centrifugal pull. The bending loads on the spar would, therefore, be smaller on the second and subsequent revolutions, and when it had attained its normal rotational speed there would be no bending loads at all, assuming that the blade had been so designed that the variation of its mass was in accordance with the formula previously given. The lift given by the rotor over the complete revolution is approximately ½ that produced over the effective lift-producing portion of the revolution when the machine is moving forward. If it is being driven round while acting as a helicopter, lift is produced over the whole circle of revolution.

Actual Design

Below is shown a set of calculations on which is based the design of a combined aeroplane and gyroplane of the type under consideration. We first of all estimate a total loaded weight for the machine. We can now choose a wing section and a reasonable stalling speed for experimental purposes. It would be best to choose one that was not too high for a primary experiment. From these estimates we can calculate the wing area required and arrange it in plan form so that the wing will be aerodynamically efficient. The fuselage of the machine will be proportionately longer than usual so that the blade may be attached to it along its length.

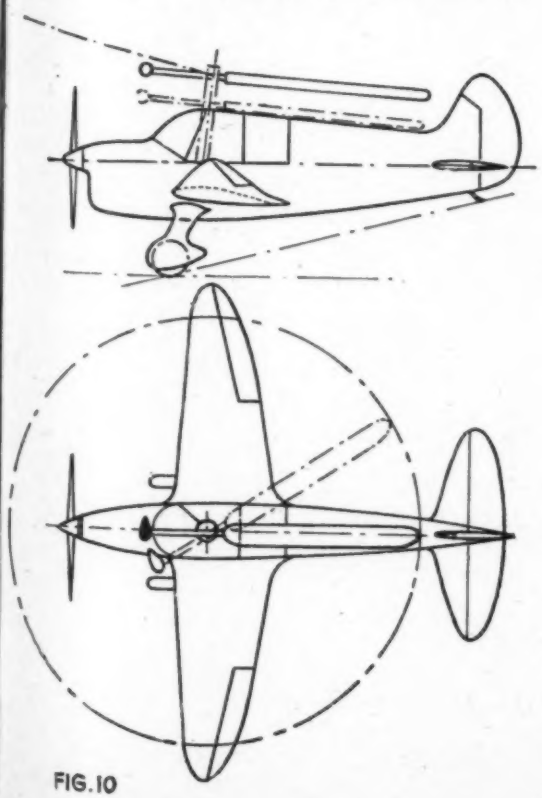


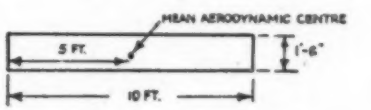
FIG. 10

From a series of trial and error approximations we arrive at a size of blade which would be suitable to influence considerably the landing speed of the aircraft as a whole. Having decided on a particular size of blade, and at what speed we require it to rotate, we can calculate how heavy it is necessary to make it and also what lift it will produce at the stalling speed of the aircraft. From this we can calculate the necessary strength of the blade when rotating. To prove that the blade can be started in the air when flying at stalling speed we have to show that the blade spar at the root is sufficient to withstand the load set up when the blade reaches its maximum lift angle at this speed. This is a limiting load because the lift on the blade will become smaller if the angle is increased further. Calculations are shown for a particular blade which prove that this is possible.

By using this type of 'gyro blade it is not necessarily intended that the whole of the weight of the machine should be supported by it; but by supporting some of the weight, the final stalling speed will be reduced.

Investigation of Bending Moment on a Rotor Blade When Not Rotating

Assume 10ft. blade 1ft. 6in. chord at 80ft./sec. (55 m.p.h.)



Section R.A.F. 34 take K_L max. = .5
Lift at M.A.C. = $K_L \rho A V^2$
= .5 × .00237 × 15 × 80 × 80
= 114 lb.
Bending moment at Root :—
Weight of blade required ≏ 37 lb.
∴ Total excess lift = 77 lb.

	114
	37
	77

∴ Bending moment = 77 × 60″ = 4,620 lb. in.
For R.A.F. 34.—Max. depth = 8.32% chord

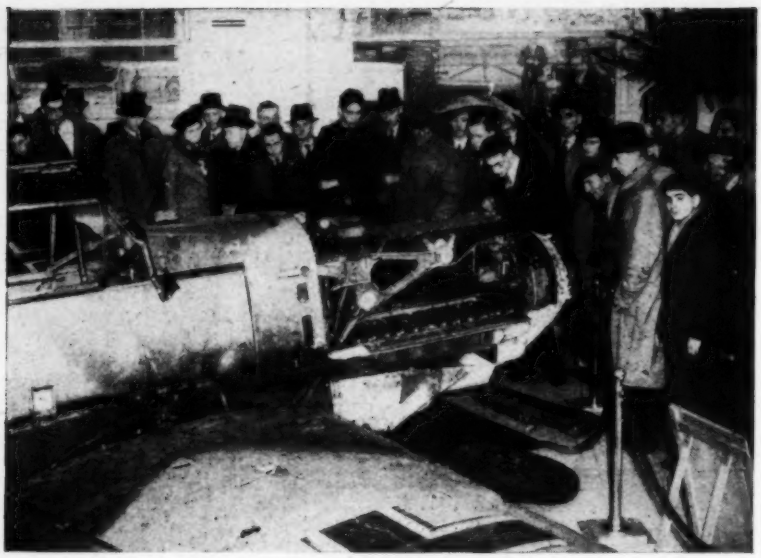
$\frac{8.32}{100} \times .18 = 1.5''$
Max. B.M. of Tube (not welded) in T 45 :—
Z for 1½″ dia. 16G = .0994
f = 42.5 ton/sq. in.
= 95,000 lb./sq. in.

Max. B.M. for the tube = 95,000 × .0994
= 9,450 lb. in.
Actual B.M. = 4,620 lb. in.
∴ This tube would withstand the max. load of the stationary blade at 55 m.p.h. airspeed at its K_L max. with a reserve factor of 2.
Weight of this Tube 10 ft. long.
(1.5 O/D − 1.375 I/D) = .282 sq. in.

	1.767
	1.485
	.282

.282 × 120 = 33.8 cu. in.
33.8 × .28 = 9.5 lb.
Total weight of main spar of blade = 9.5 lb.
Total weight of blade required = 37 lb. (see below)
Calculation for required weight of blade :—
Assume C.G. of blade at M.A.C. Then at a coning angle of 10 deg. to lift a m/c. of weight 1,000 lb.

(*Continued on page* 404)



WAR WEAPONS WEEK: An Me 109 on exhibition in the Piccadilly showroom of Rootes, Limited, to help the Westminster War Weapons Week.

THE INDUSTRY

The "General" Filter

WELLWORTHY PISTON RINGS LIMITED announce that, owing to pressure of national work, they have been compelled reluctantly to terminate, as from October 31, 1940, the arrangement by which they acted as sole distributors for the "General" filter. All enquiries should now be addressed to: British Filters Limited, Aircraft House, Market Harborough. 'Phone: 2254-5.

Ellison Insulations Change

CHANGES at the Ellison Insulation Company's works, due to expansion of their business, have made it necessary for the offices of their Midland area engineers to be moved to 36, Bennetts Hill, Birmingham, 2 ('phone: Central 5651; telegrams: "Ellison Phone Central 5651").

The new offices were opened on Monday, November 4, 1940. From now onwards, enquiries regarding Tufnol from users in the Midland area should be sent to the new address. The Midland area—roughly from Chester to the Wash and from Bristol to Southwold—will continue to be managed by Mr. E. J. Reynolds, with Mr. W. G. Phelps as resident engineer for Wales.

Soldering Notes

FIRMS engaged on contracts involving soldering processes should be interested in the reference sheet, "Technical Notes on Soldering," just issued by Multicore Solders Limited, of Bush House, London, W.C.2.

This publication, which will be supplied free of charge on request, contains considerable useful information regarding soldering problems of interest to the electrical, radio and aircraft industries.

Besides explaining the advantages of Ersin Multicore Solder, which has three independent cores of non-corrosive Ersin flux, the reference sheet contains useful tables giving the melting point of solders in their various alloys and details of the different gauges recommended for specific soldering processes.

Under the section entitled "Importance of Melting Point," it is revealed why the use of an incorrect alloy can cause defects in electric motors. Much useful information is also given regarding fluxes for soldering. It is claimed that Ersin flux possesses the non-corrosive properties of rosin, but avoids dry or high-resistance joints by removing more efficiently than rosin the surface oxides of nickel or other plated surfaces, for which hitherto corrosive fluxes of the acid type have had to be employed.

Dunlop War Weapons

THE Dunlop Rubber Company have contributed £50,000 to Birmingham's War Weapons Week. In addition the chairman of the company, Sir J. George Beharrell, has given £5,000.

The company had already deposited £500,000 with the Government free of interest, but the conditions of the Birmingham War Weapons Week made it impossible for this advance to be included in the Birmingham War Savings Committee's total.

Tolerances for Thread Gauges

IN connection with the recently issued War Emergency British Standard No. 919 for Screw Thread Gauge Tolerances, we are advised that the tolerances recommended in this Specification were formulated in co-operation with the National Physical Laboratory, and during the period of the war the National Physical Laboratory has agreed to test screw gauges in accordance with this British Standard in cases where it differs from the current practice of the Laboratory, unless specially instructed otherwise.

Macrome Busy

MACROME treatment of cutting tools has proved so useful that the firm is concentrating on this branch of their business. Tests carried out at an aircraft factory show the increased production per tool to be remarkable, in some cases the wear life being increased eightfold. This treatment, it will be remembered, affects the whole of the bulk of the steel treated, and is not a case hardening or deposition. It is applied when the tools are normally regarded as ready for use.

Considerable factory extensions have been made to cope with the increasing demand for treatment of tools, steel parts and articles subject to wear and fatigue. A branch under Mr. C. L. Bayliss has been opened in Glasgow to handle Scottish requirements, while the branch at Manchester and the works at Birmingham go ahead at full pressure.

THE CASE FOR THE SINGLE-BLADED ROTOR (Continued from page 403)

Mass of blade as follows (see Fig. 8)

$$L = CF \sin \alpha^\circ \quad \therefore 1{,}000 \text{ lb.} = C.F. \sin \alpha^\circ$$

$$\therefore \text{cent. force} = \frac{1000}{\sin 10^\circ}$$

$$= \frac{1000}{.174} = 5{,}750 \text{ lb.}$$

Cent. Force required = 5,750 lb.

$F = W_7C$ Where W = lbs. r = Rad. in in. at 300 r.p.m.; C = 2.56 (constant)

$$\therefore 5750 = W\,60 \times 2.56$$

$$W = \frac{5750}{60 \times 2.56} = 37.5 \text{ lb.} = \text{wt. of required blade.}$$

Theorems Relating to Autogyrating Blade

THEOREM I.—For a blade to be in equilibrium along its whole length with regard to lift and centrifugal force, causing a constant coning angle, if the width of the blade is constant the rate of increase of the mass of the blade must be proportional to the radius at that point; e.g., if the mass of a small length of blade at rad R is M *lb.* the mass at rad 2 R is 2 M *lb.*

For a small width of blade dr. at Rad R ft. where W lb. is the mass of this portion,

$$W = \frac{K_L \rho \, 1 \, dr. \, 4\pi^2 R}{1.227 \tan \theta}$$

K_L = K_L for section at the particular angle

1 = width of blade

θ = coning angle

ρ = .00237.

THEOREM II.—The limit of speed of an autogyrating blade is reached when the resultant of the lift and drag is parallel to or passes through the centre of the axis of rotation in the same line.